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CONDUCTION ANESTHESIA FOR MINOR SURGERY*

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IT IS interesting if not instructive to know that in 1915 there were ten articles published in the American medical literature on local, conduction and spinal anesthesia. In 1920 there were twenty-three contributions. In 1929 one hundred twenty-two articles were published by American authors. During the same year European physicians contributed more than twice this amount. For the most part these articles had been written by and for the specialist. There has been little or no attempt made to describe a simplified technic that could be readily understood by the general practitioner.

There were three medical colleges in the United States teaching local and conduction anesthesia in 1920. This may explain to some extent why this form of anesthesia is not more generally used by the profession. In fact the majority of general practitioners have little or no conception of the dosage, advantages, or technical use of novocaine anesthesia. This is well exemplified by the answers obtained from questionnaires sent to several hundred physicians in country practice, without hospital associations, with the inquiry: "How many cubic centimeters of a 1 per cent novocaine solution would you consider it safe to inject into a patient weighing 150 pounds." Two hundred four replies were received: A trifle over 50 per cent of the physicians were kind enough to answer. Of these 63 per cent considered 2 to 4 c.c. a maximum dose. Sixteen per cent thought it safe to use from 2 to 10 c.c.; 8 per cent would use from 5 to 15 c.c.; 6 per cent not over 20 c.c.; 3 per cent up to 30 c.c. One replied "use enough." These replies demonstrated quite conclusively that a vast majority of the practicing physicians of the country have not had adequate training in this branch of anesthesia, either during their college course or their hospital internship; especially, when one considers that Babcock, Farr, Lowsley, Jones and the author have repeatedly used 400 to 500, and even 600 c.c. of a 1 per cent novocaine solution without causing untoward effects, and in none of the cases were toxic symptoms observed.

Local and conduction anesthesia is very rapidly becoming the anesthetic of choice, as is shown not only by the increasing number of articles that are written each year, but by the fact that in 1908, 2 pounds of novocaine were sold in the United States, and at present there is a consumption of approximately 2000 pounds a week. Practically every university hospital in the United States is now using routinely some form of local or spinal anesthesia, whereas in 1920 the technic was taught in three of our colleges.

For some unknown reason local and conduction anesthesia has been looked upon as a highly specialized art, far too technical and dangerous to be practiced by the untrained. Possibly this conception regarding the relatively small dose of 2 to 6 c.c. was due to the fact that the only available source of novocaine solution

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was the dentist's ampule. If the physician had obtained adequate instruction in his college course or practical training during his internship, he would not have regarded the technic as being highly specialized, but instead would have been familiar with its relative simplicity.

We are obligated to our patients by virtue of their confidence in us to resort to every known means to protect their lives to the best of our ability. Are we worthy of that confidence when we deliberately expose them to the possibilities of ether pneumonia, lung abscesses, shock and gas distention, ileus or acute dilatation of the heart or stomach? Are we adhering to the implied law when we give any form of inhalation narcosis to a cardiac, nephritic, drug addict, alcoholic or asthmatic patient, to those suffering with eclampsia, diabetes, hypertension, arteriosclerosis, decompensation of the heart, pleurisy, pharyngeal obstructions, or the obese, when a safer method is available?

Should patients be subjected to the many dangers of inhalation narcosis? Should they be compelled to bear the added financial burden of general anesthesia? Should they be hospitalized or compelled to remain in bed following ether anesthesia? Should tubercular patients be subjected to the possibilities of a fatal pneumonia, or should the profession at large familiarize themselves with a safer, more effectual and more economical form of anesthesia than the ether cone?

The technic of conduction anesthesia has been so simplified, so modernized and the anesthetic solution so safely prepared that there would seem to be no possible excuse for using ether anesthesia in minor surgery. Conduction anesthesia enjoys undisputed advantages over

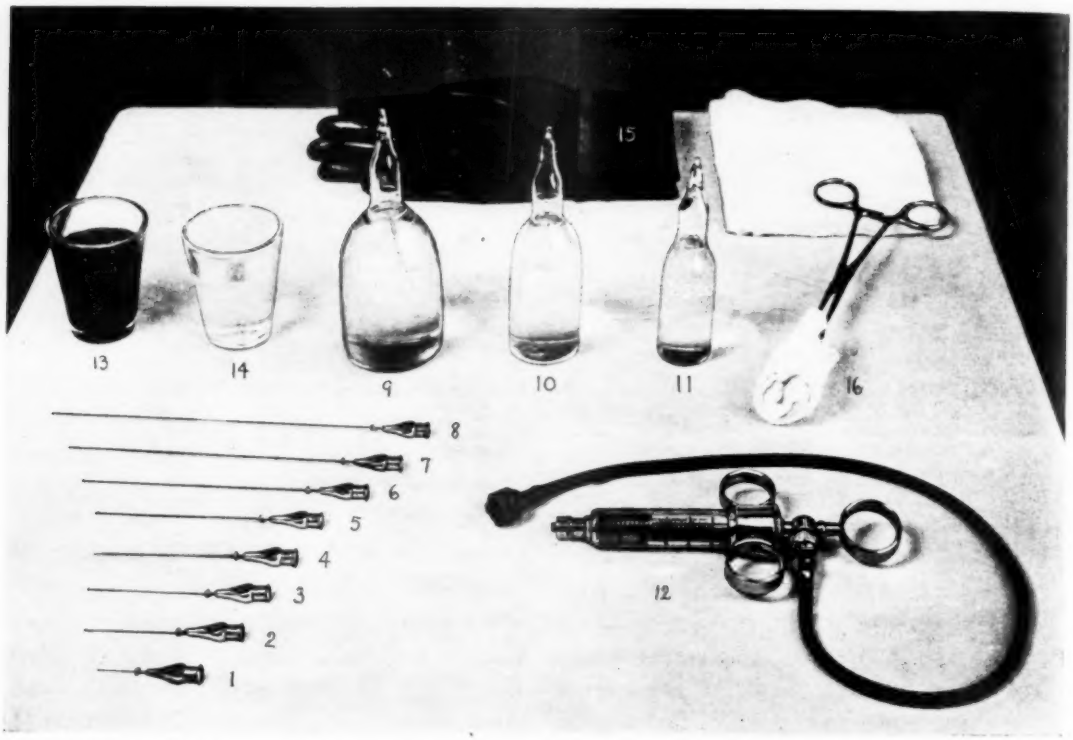

Fig. 1. Table set up with essentials for conduction anesthesia. 1, needle ¾ inch 25 gauge; 2, 1½ inch 22 gauge; 3, needle 2 inch 22 gauge; 4, needle 2½ inch 22 gauge; 5, needle 3 inch 22 gauge; 6, needle 4 inch 22 gauge; 7, needle 5 inch 22 gauge; 8, needle 6 inch 22 gauge. 9, 10 and 11, 100 c.c., 50 c.c., and 25 c.c. ampules of novocaine solution. 12, Pitkin continuous flow syringe. 13, Iodine solution. 14, Alcohol. 15, Gloves. 16, Gauze and sponge holder.

other forms of analgesia or general narcosis, in that the patient does not have to be prepared before administration. In fact their preanesthetic state. It is more economical than any form of inhalation anesthesia. This resolves itself into only one

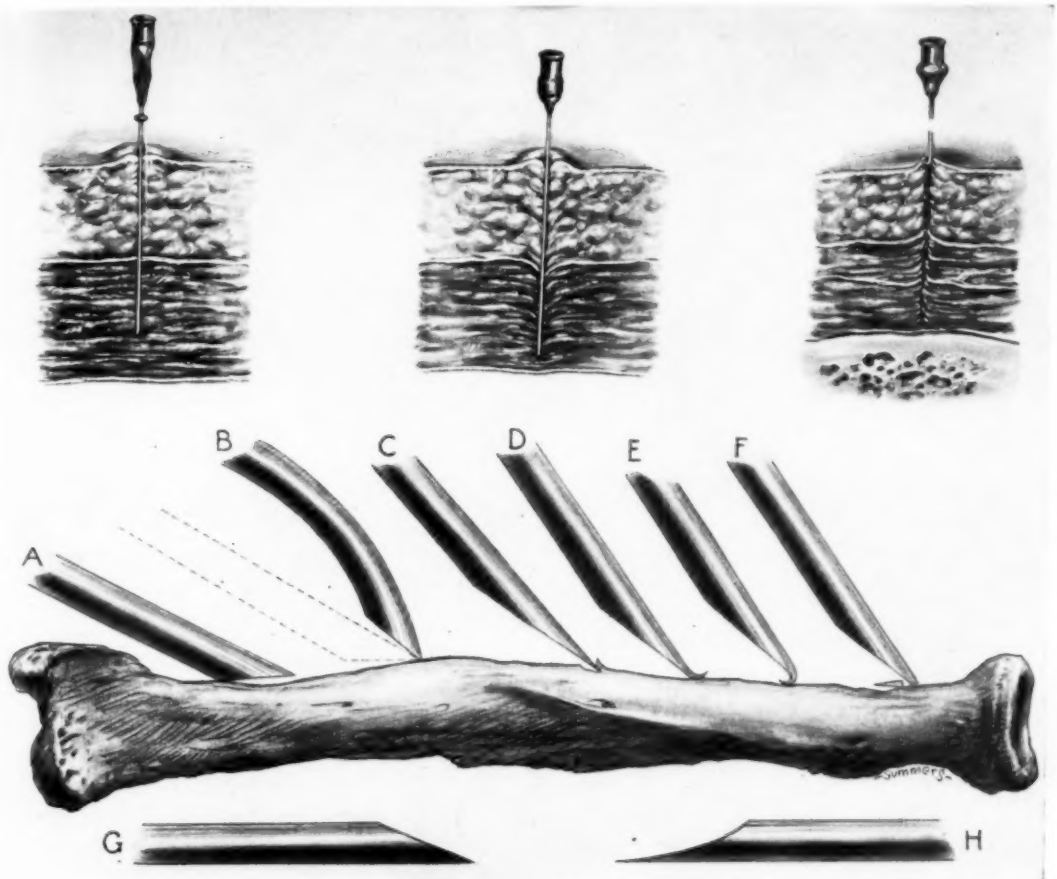

Fig. 2. Upper left: Sharp needle does not tear or traumatize tissues. Upper center: dull needle forced into body causes mutilation and trauma of tissues. Upper right: needle point has been bent. When it is withdrawn tissues are torn. A short beveled needle (A) may be glided over bony surfaces. If the point (B) catches in the bone it will not break. The long beveled needle (C) may cut or penetrate the periosteum, or the point may become bent (D, E) or broken (F). The short beveled needle (G) is preferable for deep injections, to the long beveled needle (H).

it is better to give the anesthetic after a hearty meal. There is no postoperative gastrointestinal disturbance. It eliminates the dread of general anesthesia. Many patients fear the anesthesia more than they do the operation. Shock is not increased by its use; by adding ephedrine shock may be more or less overcome. Arrested tubercular cases are not converted into active ones. Active cases are not subjected to the dangers of fatal lung complications. It may be administered to asthmatics, nephritics, and those suffering with heart lesions, without altering logical conclusion that the physician or surgeon who in this day and age is not prepared to give certain patients conduction anesthesia is inefficient to the extent of denying his patients something to which they are justly entitled, namely the safest anesthetic.

The advantages of conduction analgesia are many and those of the profession who are familiar with its use look upon it as the safest form of anesthesia we possess for all major or minor surgical procedures with a possible exception of local.

The operator may administer it himself,

a distinct advantage to the country physician, to the industrial surgeon and in emergency cases.

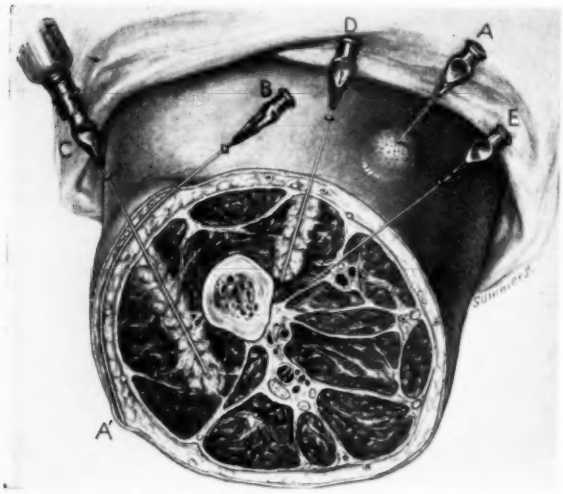

Fig. 3. Intradermal wheal is made with a 25–27 gauge needle (A). Subdermal wheal (A) is raised by causing needle point to penetrate skin from within. Subcutaneous wheal is produced by injecting anesthetic solution in tissues close to skin (needle B). By projecting novocaine solution ahead of needle C, injection is not painful. Injecting solution so that it anesthetizes tissues at side of needle D does not eliminate pain. Pain is produced when needle E is inserted into tissues.

It is more economical to the surgeon, because expensive and cumbersome apparatus is unnecessary; to the patient, as the anesthetist's fee may be saved.

It permits cooperation of the patient, a marked advantage when one is working without assistants in the home or office.

There is no paralysis of the anesthetized field. The patient is able to move, turn or adjust his position to help the surgeon in his work.

Convalescence is shortened and in many cases the patient may be permitted to go home at once. Hospitalization is unnecessary.

The anatomy is not distorted as with local anesthesia. There is no edema of the operative field. The possibility of secondary hemorrhage is lessened. It may be used to anesthetize infected or inflamed fields without fear of contaminating healthy tissues.

Postanesthetic nausea, vomiting, distention or suppression is seldom observed.

No postanesthetic complications follow its use as pneumonia, bronchitis, lung abscesses, etc. Therefore, it is more desirable for the emaciated or aged patient.

It may be administered to patients with inflammatory lesions of the respiratory tract without fear.

Patients do not have to be prepared for the anesthetic.

Conduction anesthesia blocks all afferent nerves. Painful impulses are not transmitted, result no shock.

For fractures and dislocations one experiences a greater relaxation than with any other anesthesia, with the possible exception of deep ether narcosis.

With its use patients suffer less postoperative pain.

It produces no change in the blood chemistry or metabolic rate.

It does not produce or increase diacetic acid or acetone in the urine. Acidosis does not have to be combated.

It is safer than general anesthesia when deep prolonged anesthesia is necessary.

Morbidity is eliminated.

The primary and secondary anesthetic mortality becomes nil.

The duration of anesthesia may be regulated according to the amount of the vasaconstrictor agent.

Regular diet may be given at once.

The contraindications of conduction anesthesia are few and as one becomes more familiar with the technic the contraindications become less and less. Children under the age of ten or twelve years might be looked upon as undesirable subjects, but it is remarkable what can be accomplished with these little patients if one will have a little patience. A bottle for infants and candy or toys for the older children will so deviate the attention of the child that the operative procedure may be carried out without interference.

Syphilitics, epileptics, insane or neurotic subjects are looked upon as undesirable for this form of anesthesia. It produces no ill-effect in a luetic, and we never make exception to these cases. We do invariably

eliminate the epileptics, not because we have reason to believe that the anesthetic would in any way affect the patient, but because we are fearful of a convulsion during the operation.

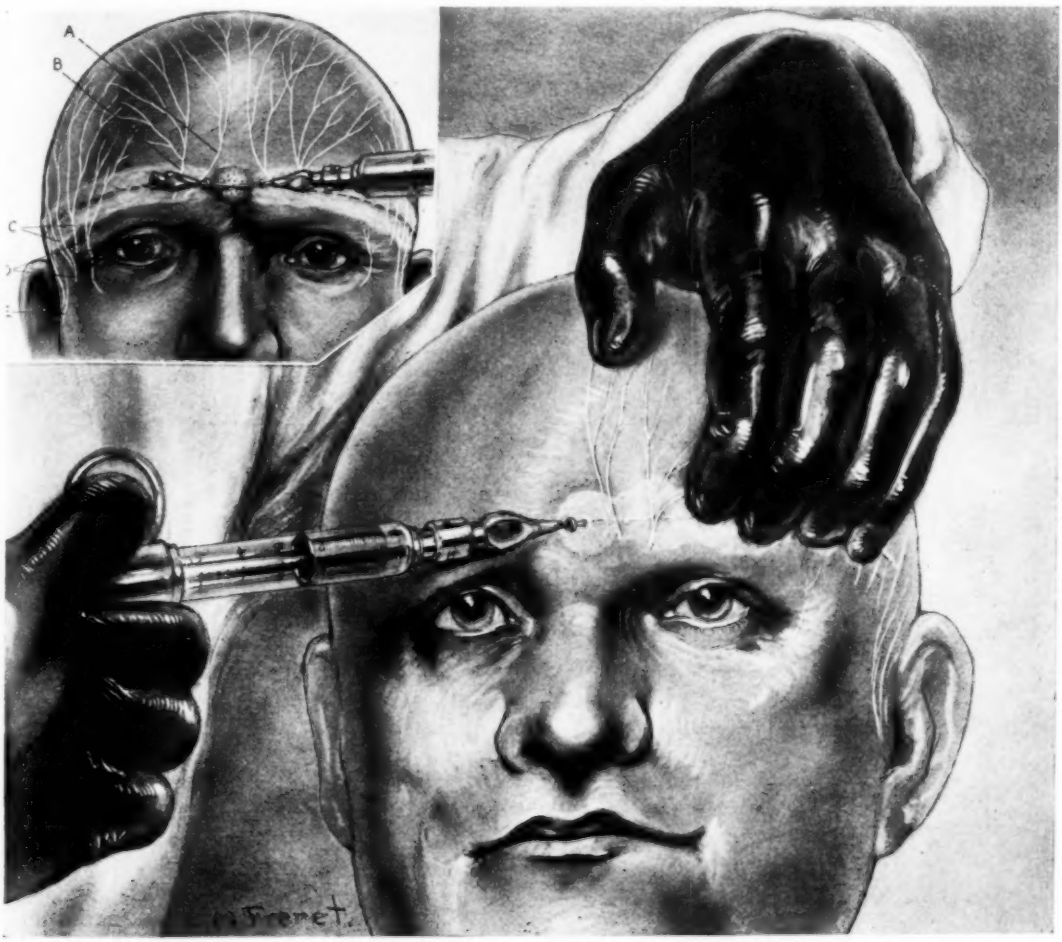

Fig. 4. Needle being guided around frontal bone by finger tips of left hand. Insert shows method of anesthetizing entire frontal region from primary central wheal.

Conduction and spinal have been the anesthetics of choice in the State Hospital at Greystone Park for the past two years. The results have been very gratifying. If the neurotic patient cannot be controlled by the preliminary use of morphine and scopolamine, or if there is reason to believe that due to their nervous state they will attribute their future real or imaginary ailments to the anesthetic it will be advisable to use inhalation narcosis.

To experience the gratifying results that are possible in surgery with this form of anesthesia one should adhere strictly to a few general technical rules. Gain the patient's confidence, promise that you will not hurt him and then keep your word. Patients once hurt may not only lose confidence in the method but the doctor. A patient who is subjected to one painful manipulation becomes over-apprehensive to all following procedures. A confidence once lost is hard to regain and may be the direct cause of an unsuccessful anesthesia.

Conduction anesthesia demands a simplified, thorough and skillful technic. When due consideration is given to the minute details the operator will be satisfied and the patient grateful. A knowledge of the anatomic parts, bony landmarks, location of nerves, deep and cutaneous, is essential. Some idea of the anatomical

relations may be had from the accompanying illustrations.

Strict surgical aseptic technic must be observed. To avoid pain never insert a needle into the tissues unless it is attached to the syringe. Always endeavor to project the anesthetic solution ahead of the needle (Fig. 3, C). This is easily accomplished by advancing the thumb in the plunger ring faster than the point of the needle travels.

To obtain the desired results with conduction or local anesthesia it is essential to have proper syringes, needles and a dependable anesthetic solution of known strength. If one is to use any old syringe or a needle of a large calibre that is rusted

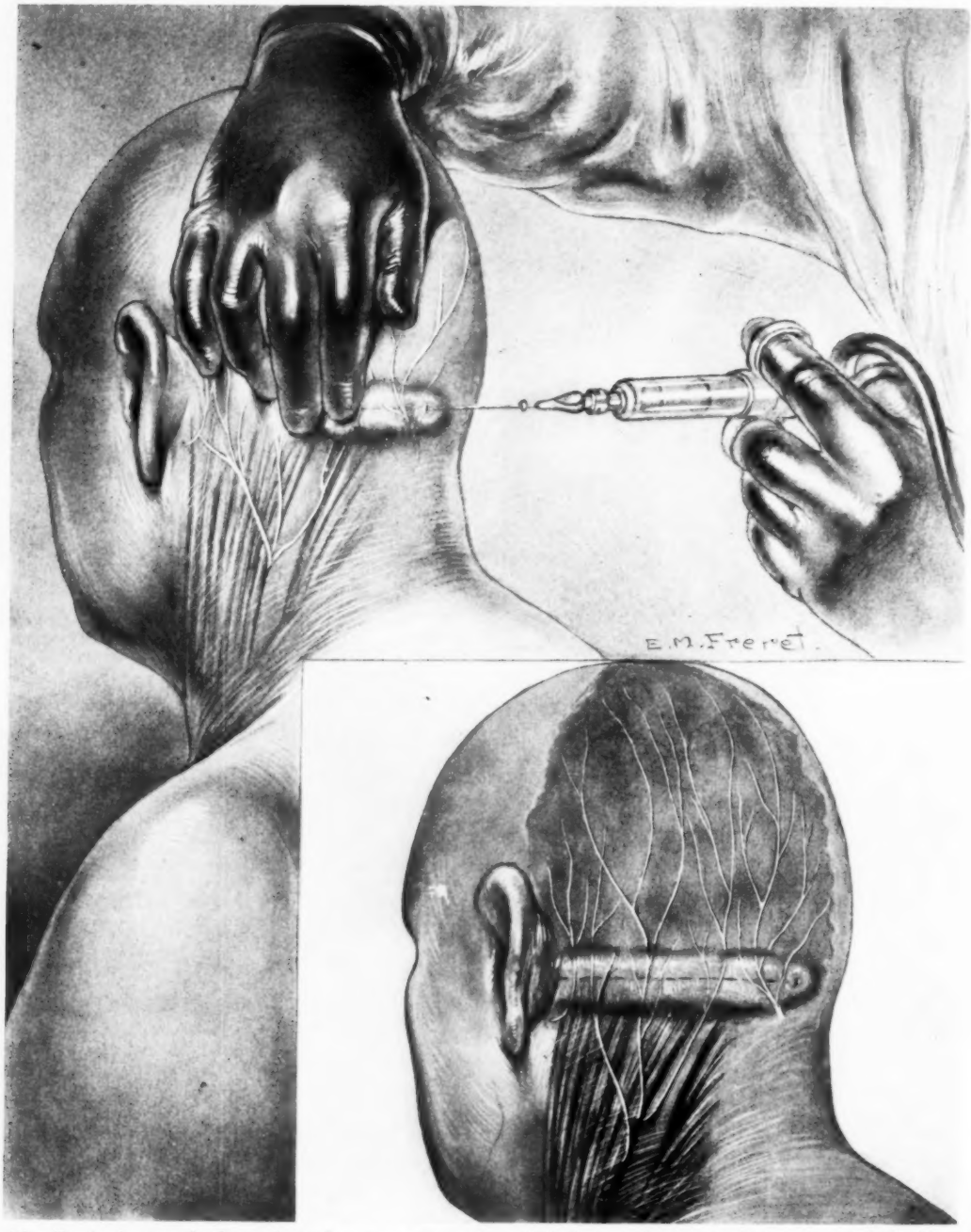

FIG. 5. Needle is inserted through scalp over external occipital protuberance. Point is guided through subcutaneous tissue by finger tips. Insert shows subcutaneous wheal, nerve supply and region anesthetized.

or dull, or a solution that is not stable or discolored, the strength of which is questionable, and the amount of vasoconstrictor

sterilized by boiling, because the piston and barrel have the same coefficient to heat.

Fig. 6. Method of anesthetizing infra-orbital nerve. Insert shows nerve distribution, shaded region represents field of anesthesia.

agent uncertain, the results will be so unsatisfactory that in all probability a good method will be abandoned before the technic is mastered. Therefore, I would suggest:

A syringe similar to the author's, a continuous flow instrument, which will permit the injection of the anesthetic agent without detaching it from the needle.

It does not have to be dismantled to be

It contains no unsanitary packing washers or threads.

It is equipped with a locking device that prevents the needle from "blowing off."

The construction is such that there are no working parts to get out of order, with the exception of a small inexpensive rubber valve.

The plunger and barrel are accurately ground which prevents leaking and elimi-

nates sticking of the piston or breaking of the barrel.

It is so constructed that it may be tip end of the syringe. This prevents the possibility of "pushing off" the end of the syringe.

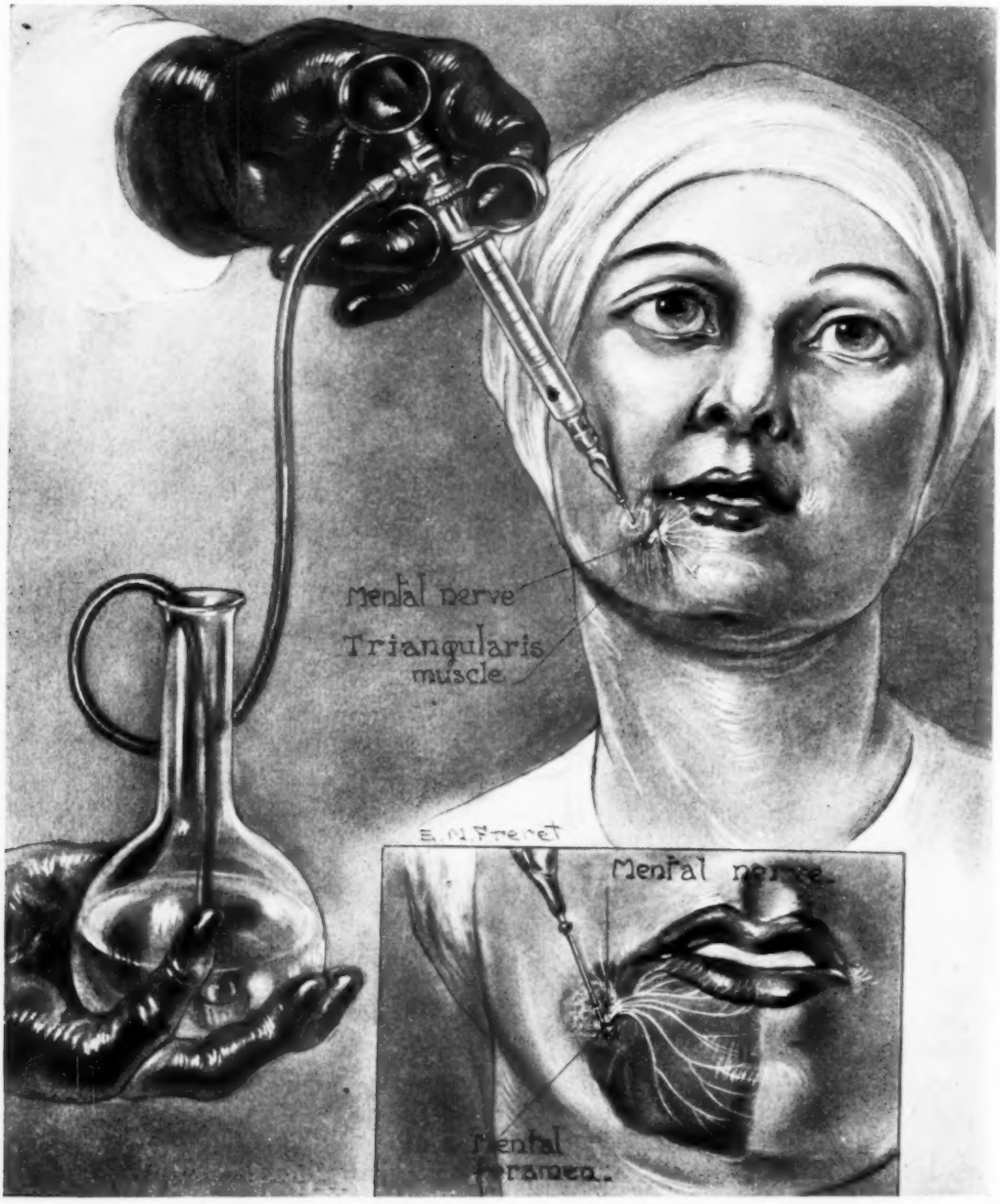

FIG. 7. To anesthetize mental nerve one should endeavor to visualize location of needle point. Foramen is usually found midway between alveolar processes and lower border of jaw, over apex of second bicuspid. Shaded portion of insert shows field of anesthesia.

easily used with one hand, a 5 c.c. capacity accurately graduated. It is equipped with comfortable finger rings that do not cut or hurt the hand.

There is a metal collar on the piston stem that permits the piston to approximate but not come in contact with the

It is so constructed that it may be refilled by withdrawing the plunger. A small valve at the side of the piston stem controls the flow, and as the piston is advanced the solution is injected into the tissues. It is worked not unlike a pump. *Should the tip of the needle be within a*

vein when the piston is withdrawn blood will appear in the barrel of the syringe which warns the operator that the needle point is in a vein and the injection should not be made.

It permits of the injection of large amounts of solution in a comparatively short time without removing the needle from the tissues or detaching the syringe.

The needles are the result of three years' alloy experimentation.

They will not rust or corrode.

They are not affected by iodine or ordinary acids.

They are very tough, and will withstand a great deal of bending and manipulation before they will break.

They are equipped with a safety guard,

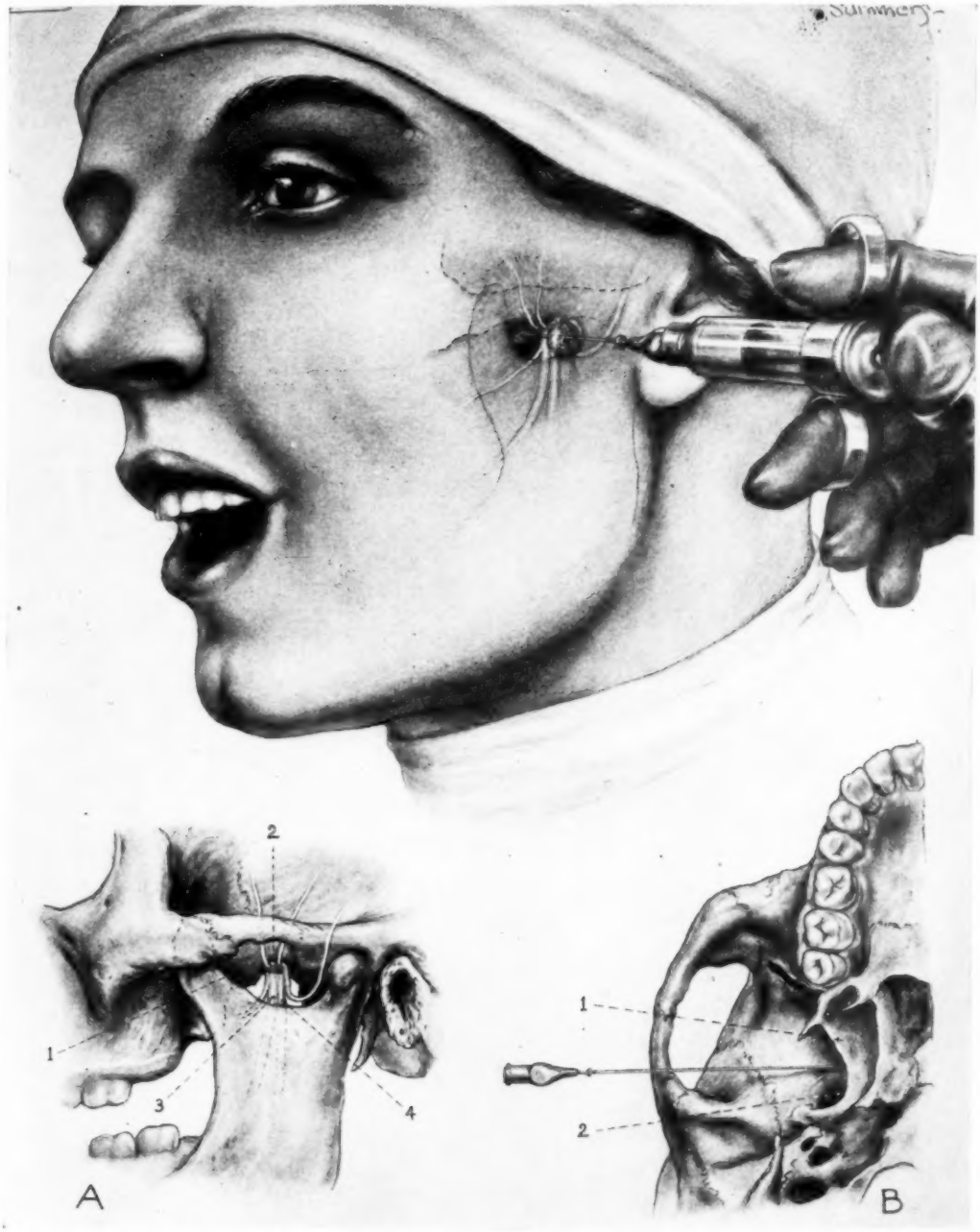

Fig. 8. Anesthetizing mental, lingual, buccal, auriculotemporal and deep temporal nerves by injecting zygomatic fossa. Inset A indicates (1) where needle approaches wing of sphenoid in close apposition to (3) lingual, (4) mental nerves, as they emerge from foramen ovale. Inset B: looking into zygomatic fossa from below, (1) sphenoid plate, (2) foramen ovale.

which prevents them from becoming lost in the tissues should they be accidentally broken.

The temper is sufficient to maintain a sharp point for a long time.

Their flexibility is such that they may

Fig. 9. Ten c.c. of a 1 per cent novocaine solution as injected under posterior border of sternocleidomastoid muscle, to anesthetize branches of superficial cervical plexus. Cutaneous field of anesthesia is shown in insert.

They may be sterilized for emergency work in a flame. Apparently they have all of the advantages of a platinum instrument at the cost of a steel needle.

be guided in the tissues or around a limb without fear of breaking, and due to this flexible feature large fields may be anesthetized through one puncture wound.

It eliminates the necessity of making a human pin cushion of a patient.

It is inadvisable to use the ordinary steel or nickeloid needle for conduction anesthesia because side pressure cannot be applied without fear of breakage. They become hard and brittle with frequent boilings and break easily. Steel needles rust and corrode. It is as painful to inject a rusty needle as it is to pass a rusty sound into the urethra. Nickeloid needles are not hard enough to maintain a sharp point. They are so brittle that a larger gauge wire is necessary to assure strength.

The wire of a needle should be as small as possible for the particular use to which it is to be adopted. It is never advisable to use a needle larger than a 22 gauge. Large needles or dull needles so traumatize the tissues that they produce pain not only at the time of insertion, but painful sensations due to the injury of the tissues sometimes last for several days. It is inadvisable to use a long-bevel needle for deep injections because if the point comes in contact with a bone it may be bent (Fig. 2), and when it is withdrawn tear the tissues, or the tip may be broken and remain as a foreign body. A short-bevel needle may be glided over or around a bone with ease.

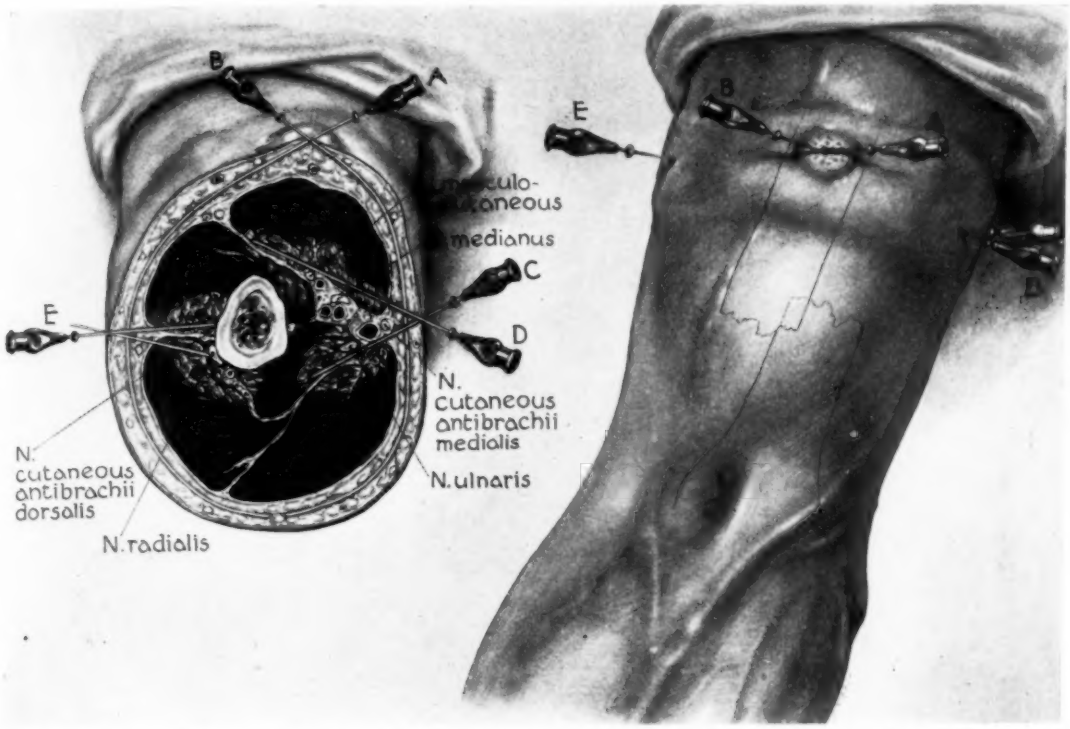

Fig. 10. Method of producing anesthesia of mid arm. Needles A and B are introduced through interdermal wheal to raise subcutaneous wheal. Needles C, D, and E are used to anesthetize deep nerves, as seen in cross section.

It is advisable to use a needle with a short bevel for deep injections because the point will not bend or break should it come in contact with a bone. If the angle of approach is sufficiently acute the rear of the bevel will make contact with the bone, which permits gliding over the periosteum without tearing or penetrating it. A short-beveled instrument may be controlled and guided in the tissues with greater ease. There is less danger of the point bending or breaking. Should the point of the needle break one will find it is a very difficult task to find and remove the foreign body.

It is always advisable to test the needles before they are sterilized. The longer needles are grasped at the hub between the thumb and finger and the point held in the same manner with the other hand,

and thus bent into a semicircle. The shorter needles are tested by placing the point against the thumb nail and applying a moderate amount of lateral pressure. If they are defective it is better to have them break at this time than in the tissues of the patient.

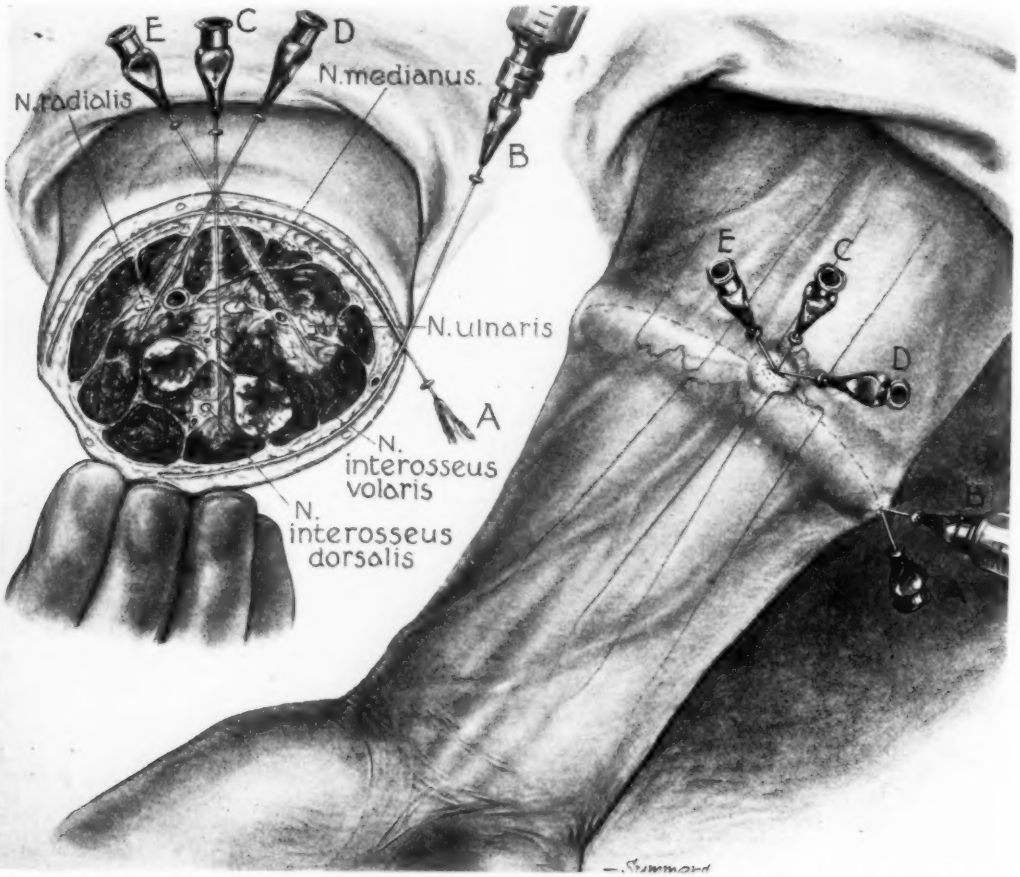

FIG. 11. Due to difference in contour of a forearm primary wheal is raised laterally and needle A is carried around anterior surface of arm; while needle B is guided by finger tips through subcutaneous tissue to meet end of subcutaneous wheal produced by needle A. Deep nerves are easily anesthetized from central point of introduction on anterior surface of arm.

The anesthetic solution should be sterile, staple, and water white, containing a known percentage of novocaine and a definite amount of the vasoconstrictor agent to maintain anesthesia for a definite time. Pink or brownish solutions should not be used. The pink color indicates that the adrenalin is oxidizing, the yellow or brownish solution signifies either that the vasoconstrictor agent has become oxidized, that the solution is stale, or has been oversterilized. The desired results cannot be expected with a preparation of this nature. In the past it has been rather difficult to prepare large amounts of novocaine solution in the home or office from the crystals, and if one required 100 c.c. of a 1 per cent novocaine solution it would necessitate approximately one hour's time to prepare it, due to the fact that the normal saline would have to be sterilized, the novocaine weighed, and dissolved in the saline, resterilized, cooled and then the vasoconstrictor agent added. This inconvenience and the consumption of time of a busy physician may explain to a great extent why this form of anesthesia is not more generally used in the home or office. One can readily see how impractical its use would be in the home.

To overcome this inconvenience and

place at the disposal of the profession a sterile, staple solution, ready for instantaneous use, the author has had ephedrine ampules are prepared for use in patients suffering from a hypothyroid condition, as it must be remembered

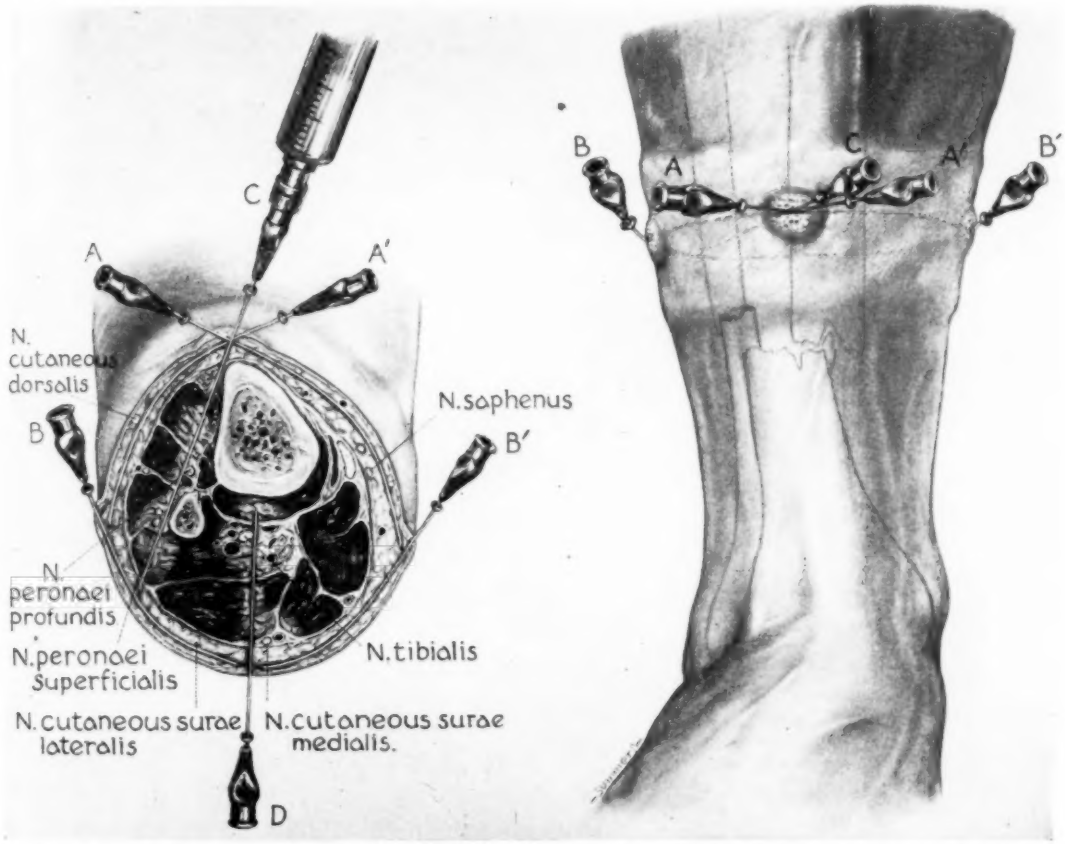

Fig. 12. Should it be impossible to guide needles A and A around leg, subdermal wheals are raised and needles B and B complete wheal. Deep nerves are anesthetized by needles C and D.

prepared ampules of 25, 50 and 100 c.c. capacity with the following formulae:

1. Novocaine 1 gm.
   Isotonic solvent 100 c.c.
2. Novocaine 1 gm.
   Suprarenin .0005 mg.
   Isotonic solvent 100 c.c.
3. Novocaine 1 gm.
   Ephedrine .050 mg.
   Isotonic solvent 100 c.c.

These ampules are sterilized by emersion in alcohol. The neck is broken and the sinker of the continuous flow syringe inserted into the solution. No other container is necessary. The plain novocaine preparation is sufficient only for anesthesia of short duration. The solution containing the suprarenin will maintain satisfactory anesthesia for two to three hours. The that these patients cannot tolerate adrenalin or any of its derivatives. To be on the safe side any patient with a pulse rate of over 110 should have the ephedrine solution in preference to the one containing suprarenin, to avoid the possible convulsions that may follow the injection of the synthetic adrenalin preparation into a hyperthyroid patient.

If too great a concentration of suprarenin or adrenalin is used the tissues will be tender and possibly inflamed for two or three days after its use. The patient may complain of a headache and blame his condition upon the anesthetic. It is not an infrequent occurrence to have a patient inform you that they cannot tolerate novocaine as it poisons their system. This

idea is perhaps derived from the dentist's local anesthesia, as they invariably use 1:50,000 adrenalin concentration, sometimes 1:25,000, and we all know the headache and soreness of the gums that follow its use. The solution already described is a 1:500,000 suprarenin concentration and will not leave any after-effects.

We have promised the patient that we will not hurt him. Now let's keep our word. Attach a 25 gauge ¾ inch needle to the syringe, expel the air from the syringe and supply tube by slowly working the piston back and forth. At the site of the initial injection raise a wheal (Fig. 3 A) the size of your finger nail. The syringe and needle are held at an angle of approximately 20° to the skin. With the point

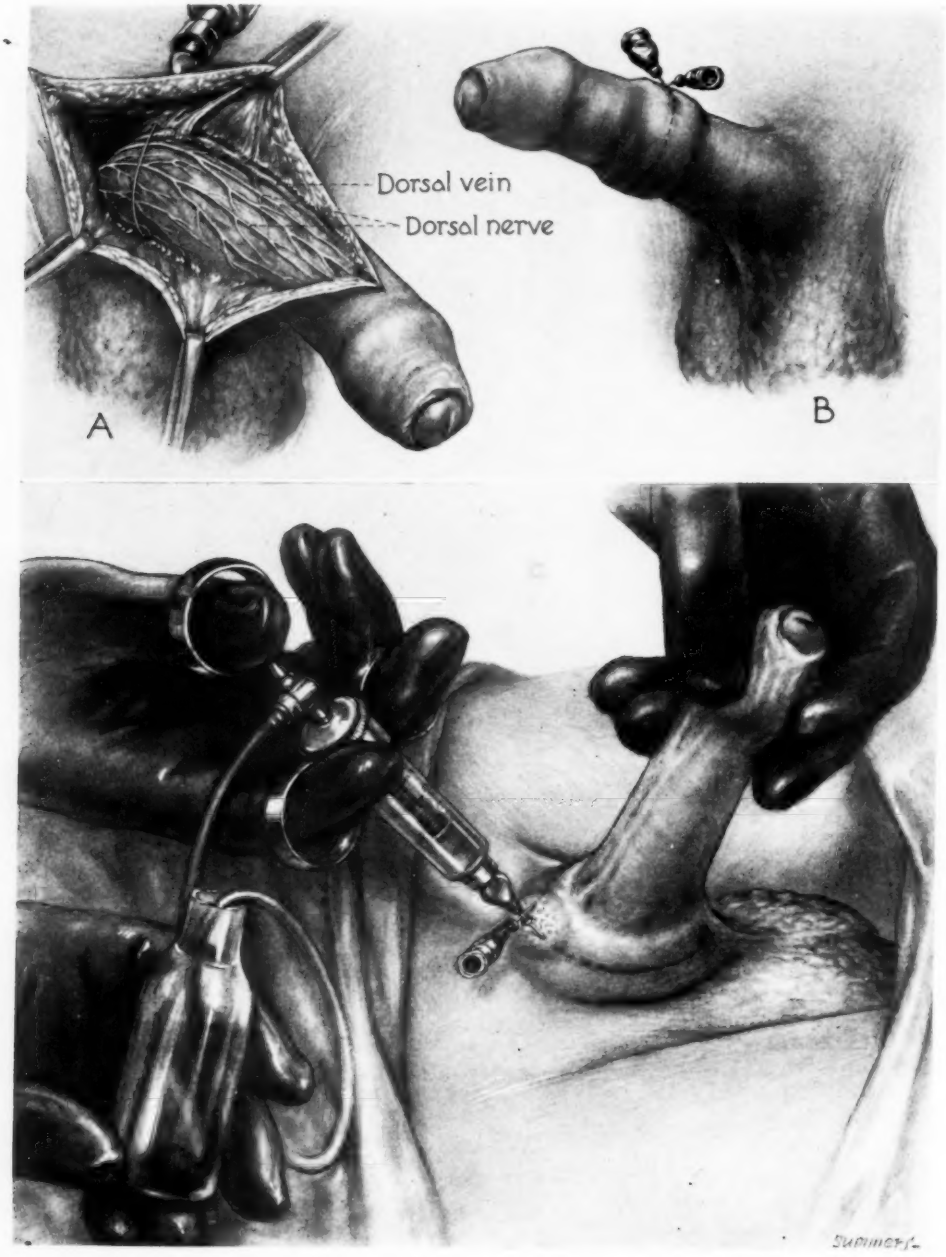

Fig. 13. Method of inserting curved needle around base of penis. Inset A shows needle passing over dorsal vein in close apposition to branches of dorsal nerve. Inset B illustrates method of producing anesthesia for circumcision.

of the needle lying at the site of the intended wheal, with the skin grasped between the thumb and finger of the left hand, or stretched in the opposite direction by the fingers of the left hand the needle is then introduced with a short, quick, thrust until the bevel has disappeared. Slowly inject a few drops of the solution between the layers of the skin until the wheal of the desired size is raised. If the point of the needle penetrates the true skin the typical wheal cannot be made as the solution is deposited into the subcutaneous tissues. The wheal may be made with little or no pain and anesthesia is produced instantaneously. It is rarely ever necessary to raise more than one intradermal wheal for a field. Should subsequent wheals be desired raise them subdermally (Fig. 3 Á). Never attempt to produce an intradermal wheal on the plantar surface of the feet, the palmar side of the hand, or the scalp. Subcutaneous wheals may be made several inches from the original wheal (Fig. 3 D) by the use of 4, 5 or 6 inch needles. If these are to be continued over a greater distance than the length of the needle a subdermal wheal may be raised by pressing the skin with the finger in advance of the needle point, thus causing the point of the needle to penetrate the skin from within. (Fig. 3 Á). The flexible needles advocated will permit one to carry the subcutaneous wheal about the arm or leg from the site of the initial insertion (Fig. 3 B), thus anesthetizing all of the subcutaneous nerves in the region. Two to 4 c.c. of solution should be injected for each inch infiltrated, the amount depending upon the region of the body and thickness of the fatty tissues. Satisfactory anesthesia may be obtained with much less solution in thin individuals.

After the wheal has been made never insert a needle for deep injections unless it is attached to the syringe (Fig. 3 E) as this is an extremely painful manipulation.

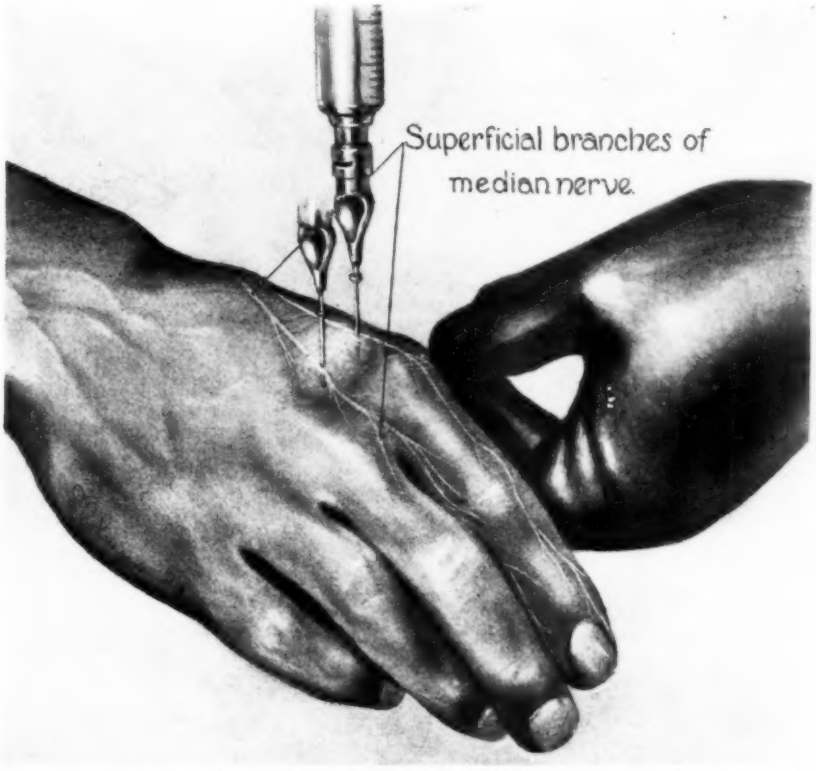

Fig. 14. Operator's fingers are placed in palm of patient's hand to prevent needles penetrating palmar skin.

When a needle is introduced into the tissues project the solution ahead of the needle as it advances (Fig. 3 c). This bony landmarks. When nerves are located in the soft tissues and one does not have definite landmarks as a guide, satisfactory

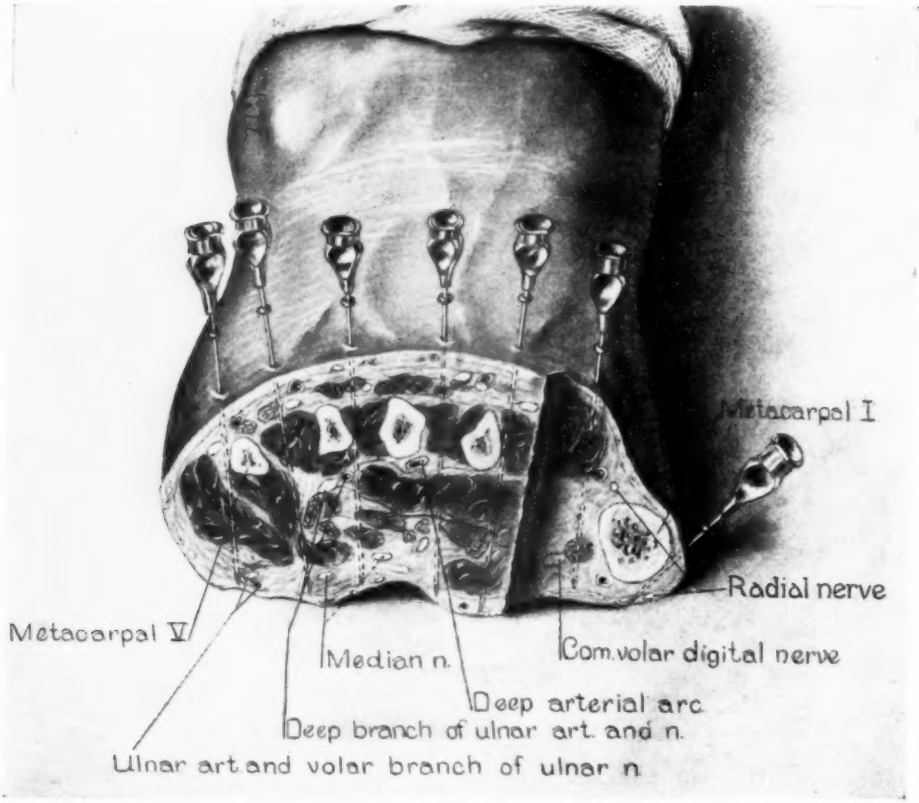

Fig. 15. Cross section of hand showing manner in which needles are introduced between metacarpal bones. Solution is projected through needles as they advance. Needle is then withdrawn to skin surface and reintroduced at an angle that would approach palmar surface, at same point that needle used to anesthetize previous interosseous space stopped.

procedure will not cause pain. Do not insert the needle and inject the solution in such a manner that it will infiltrate the tissues about the side of the needle as this will not eliminate painful sensations.

The superficial or cutaneous nerves are anesthetized with comparative ease. When definite cutaneous regions are to be made insensible to pain it is of course essential to be familiar with nerve supply, and one should know where and how to approach the supplying nerve trunks. To anesthetize the deep nerves satisfactorily an accurate knowledge of their location is required. The operator should not only be familiar with the exact location of the nerve trunks, but he should have a knowledge of their relationship to definite results may be expected only with practice and experience.

One must bear in mind that the intensity and time required for complete anesthesia of a region will depend upon the skill and training of the physician, the size of the nerve trunk and the quantity and strength of the anesthetic solution injected. One should endeavor to so perfect his technic that satisfactory anesthesia may be secured with relatively small amounts of solution rather than use large quantities. If the tissues of the arm or leg are infiltrated sufficiently anesthesia of course will occur in the distal parts, but this again is approaching local anesthesia, which we are desirous of avoiding. It is our object to anesthetize the afferent

nerves and this may be best accomplished by injecting the solution as near the nerve trunk as possible.

the anesthesia, but relieves the psychic reaction.

The space allotted to this article will

Fig. 16. Anesthetic solution is deposited close to bone. Location of anterior and posterior nerves should be kept in mind and a greater amount of solution deposited about location of nerves.

Ordinarily a 1 per cent novocaine solution is sufficient for most anesthesias. Large nerve trunks or those situated deep within the tissues may be more quickly anesthetized with a 2 per cent preparation. Usually satisfactory anesthesia of the smaller nerves occurs within five to seven minutes if the proper technic has been employed. Should there be no anesthesia after ten to fifteen minutes a second injection may be made without fear. The patient will rarely if ever require any premedication for the ordinary minor surgical procedure. The fears of a nervous individual may be allayed by a preliminary hypodermic of morphine sulphate 0.016 mg. and scopolamine 0.0004 mg. This does not intensify

not permit a complete and accurate anatomical description of the nerve supply, neither will it suffice to describe the minute details of technic as completely as the author desires. Therefore, we must rely upon illustrations to help us exemplify the technical procedures. It has been said that one illustration will convey as much knowledge as 500 words of text. This being so, we may be able to convey our ideas by using a sufficient number of drawings.

The frontal and temporal frontal region of the scalp from the orbital eminence to the vertex is supplied by the frontal, supraorbital, zygomatic, temporal and the auricular temporal nerves, all branches of the trigeminal. These are easily anesthet-

ized by raising a wheal midway between the superciliary arcs. Then attach a 5 or 6 inch 22 gauge flexible needle to the syringe.

FIG. 17. Cross section of finger illustrating location of nerves, relation of needles to bone and nerves. Original contour of finger is preserved by transparency.

The needle is introduced through the center of the wheal at right angles to the skin until the periosteum is felt. Two to 3 c.c. of the anesthetic solution are injected. The needle and the syringe are then carried to the side so that the shaft of the needle lies in close apposition to the skin surface pointing toward the upper part of the ear of the side to be anesthetized. The needle is then rotated so that the arrow on the hub is upward toward the vertex. This would indicate that the bevel is pointing toward the patient's face. As the needle is advanced 1 to 1.5 c.c. of solution is projected into the tissues for each centimeter of tissue penetrated. This produces an edema of the tissues and causes the skin to become elevated, increasing the depth of the subcutaneous space. The needle is easily guided through the edematous tissue with the finger tips of the left hand (Fig. 4). Fifteen to 20 c.c. of solution will produce satisfactory anesthesia in the adult. Should anesthesia of the entire frontal region be desired withdraw the needle point to the skin surface. It is then pointed in the opposite direction (inset, Fig. 4) when the operator proceeds as before. Should one be fortunate enough to be ambidextrous this procedure is relatively simple. It is unnecessary to do a field block of the frontal region making several punctures of the scalp completely about the region to be operated upon, as all of the afferent nerves of the entire frontal region are completely anesthetized from the one central point. This method affords satisfactory anesthesia for the removal of sebaceous cysts, birth marks, or suturing the scalp. If the nerves have been cut or torn at the time the laceration was produced the skin surface distally has no painful sensations. Should the nerves be intact they are anesthetized, again demonstrating that it is not necessary to surround the lesion with a field of novocaine solution.

The occipitoparietal and posterior temporal regions are supplied by the greater and lesser occipital and posterior auricular nerves. The great occipital is a branch of the second cervical; the lesser occipital and posterior auricular are branches of the second and third cervicals. To anesthetize these a 25 gauge needle is attached to the syringe and inserted through the scalp down to the bone over the external occipital protuberance. Inject 2 to 3 c.c. of a 1 per cent novocaine solution, which raises a subcutaneous wheal, then attach a 6 inch needle, introduce this through the subcutaneous wheal, carry it to the side so that the shaft of the needle approaches the scalp surface, pointing towards the upper portion of the ear, and project the novocaine solution, 1 c.c. for each centimeter of tissue penetrated. The needle is guided around the skull (Fig. 5) by the finger tips of the opposite hand. Should the needle penetrate the pericranium and be caught in the bone it is slightly withdrawn and advanced with less pressure by

the finger tips. Should the needle begin to penetrate the scalp more solution is injected to produce a greater edema, which will elevate the scalp from the cranium and increase the thickness of the fascia. It is then slightly withdrawn and guided along the superior linea nuchae as before until the subcutaneous wheal extends from the occipital protuberance to the ear (Fig. 5). When anesthesia is desired of both sides of the occipital and the right and left temporal parietal regions the needle point is withdrawn to, but not from the skin surface. It is then carried to the opposite side and the injection made as before. This suffices to anesthetize the occipito-parietal and posterior temporal regions for any minor surgical procedure that may be required.

By using two primary sites of injection (Figs. 4, 5) the entire skin fascia, pericranium and cranium may be anesthetized, which will suffice for major operative procedures on or within the cranium. Patients rarely if ever complain of any pain with this form of anesthesia, but occasionally where a Martell trephine is used they will mention that they feel a sensation of heat, which would indicate that thermal sensations have not been entirely obliterated.

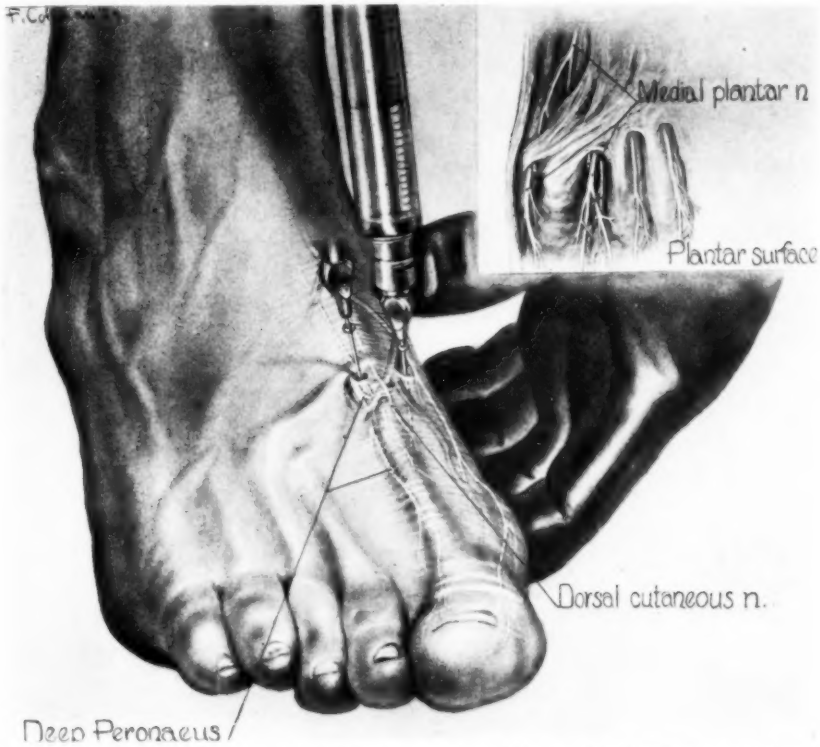

Fig. 18. Method of anesthetizing tissues about first metatarsal bone for bunion operation. Note position of operator's fingers on sole of foot. Insert shows relation of needle points to plantar nerves, as needle approaches sole of foot.

Minor surgical operations may be performed upon the lower lid, the anterior portion of the face adjacent to the nose, the alae of the nose or the upper lip by anesthetizing the infraorbital nerve. Lip operations invariably necessitate the injection of both right and left infraorbital foraminae. The needle is introduced through a wheal in the cheek directly below the pupil about 2 cm. below the orbital margin. Ordinarily the foramen may be palpated through the cheek. If this is possible the procedure is much more easily carried out. If it is impossible to palpate the foramen accurately the needle should be inserted through the wheal until it reaches bone, and 1 c.c. of the solution

injected. The syringe and needle then should be adjusted so that the point of the needle will be directed towards the needle that is used to raise the wheal may be carried into the tissues for this injection; the foramen should be searched

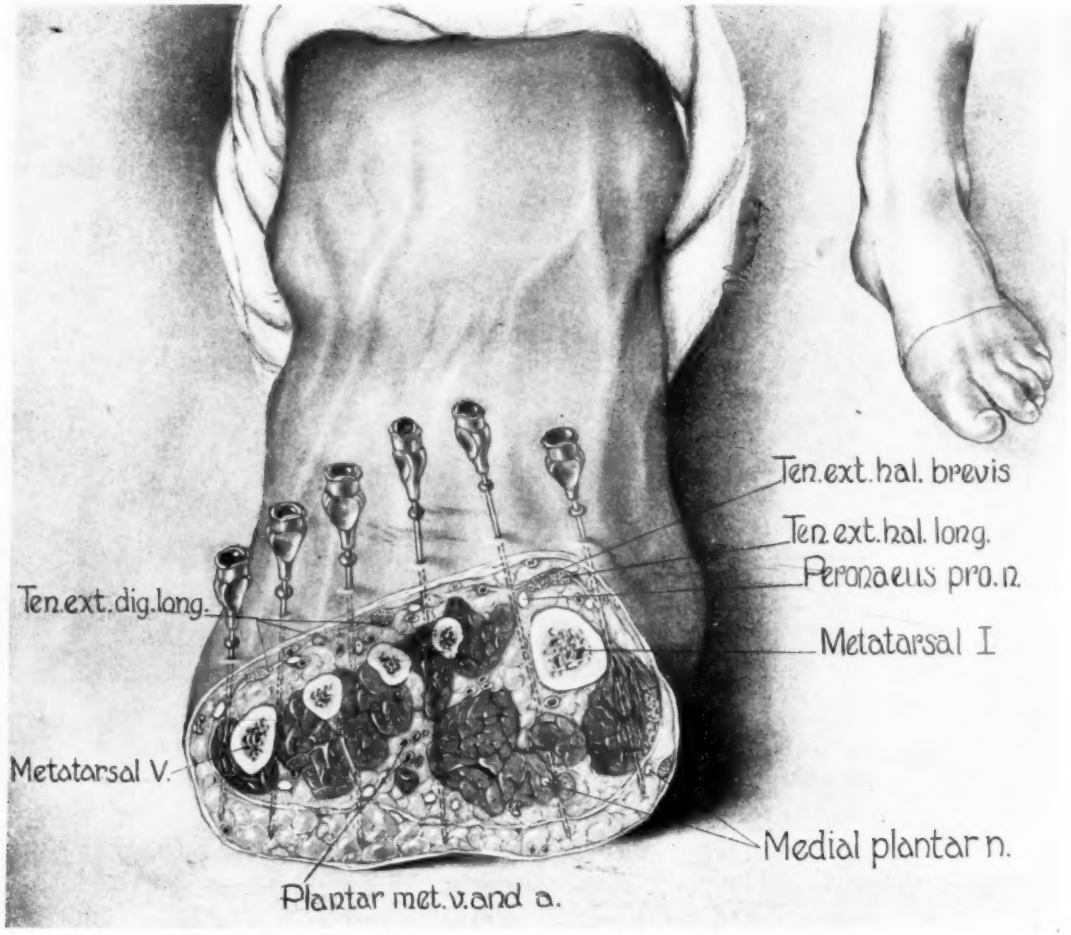

Fig. 19. Cross section of foot showing method of inserting needles through interosseous spaces. Needles are again withdrawn to skin surface and reintroduced, fan-like. Six to 8 c.c. of a 1 per cent novocaine solution are introduced into each interosseous space.

pupil and the supraorbital notch (Fig. 6), with the arrow on the needle facing the operator, then the bevel is directed towards the bone. This will permit the needle's gliding over the bone with ease. The barrel of the syringe should then be over the mental foramen or the second bicuspid. By gently moving the point of the needle upward toward the orbit it will glide into the foramen. The bony wall of the canal will prevent the needle from progressing farther, at which time 1 to 2 c.c. of a 1 per cent novocaine suprarenin solution is injected. The ¾ inch 25 gauge for with gentle manipulations to avoid pain or the possibility of a broken needle.

This procedure may be also used for injecting the infraorbital nerve with alcohol for localized facial neuralgia. The alcohol solution should not be introduced into the nerve tissue until complete anesthesia has been secured.

Operations on the lower lip, chin, the lower jaw, the incisor teeth or bicuspids may be performed without pain by blocking the mental nerve, which is accomplished by raising a wheal midway between the angle of the mouth and the lower

margin of the mandible, directly over to the apex of the second bicuspid. The needle is then directed downward and patient opens and closes the mouth the condyle and coronoid processes may be palpated, which will assist materially

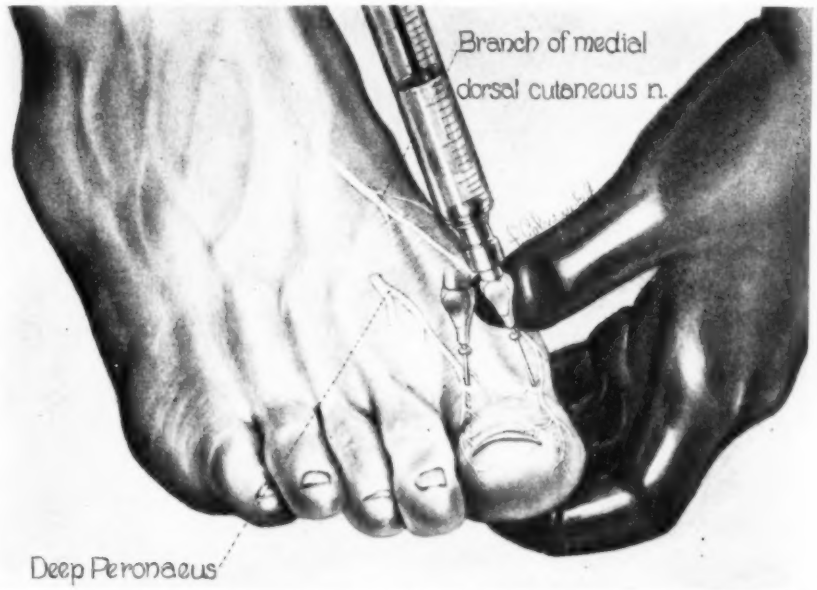

Fig. 20. For removal of toe nail or other operative procedures on great toe anesthesia is produced by depositing 4 to 6 c.c. of a 1 per cent novocaine solution about its base.

forward and advanced until bone is encountered. Inject 1 c.c. of the anesthetic solution before the mental foramen is searched for. This should be found opposite the apex of the second bicuspid midway between the alveolar process and the lower border of the jaw. With the bevel of the needle directed toward the bone it glides into the foramen with comparative ease (Fig. 7). Inject 0.5 to 0.75 c.c. of solution, rotate the needle one-half turn upon its own axis and gently force it deeper into the canal, and inject an equal amount of the anesthetic solution. This will almost instantaneously anesthetize the mental nerve, and the solution that is forced into the canal also produces anesthesia of the nerves supplying the incisor cuspids and bicuspid teeth, also the jaw bone from the bicuspids to the midline.

Operative procedures may also be carried out upon the entire mandible, the lower lip, the tongue or the floor of the mouth by raising a wheal on the skin surface below the inferior border of the zygomatic processes over the sigmoid notch. As the in locating the sigmoid notch of the ascending ramus. Attach a 2 inch needle to the syringe, insert this at right angles to the skin surface through the center of the wheal previously raised. As the needle is advanced through the skin, connective tissue and masseter muscle, the anesthetic solution should be projected ahead of the needle point. The needle is advanced until the bony resistance of the great wing of the sphenoid is encountered, when 7 to 10 c.c. of solution are slowly injected into the zygomatic fossa (Fig. 8). This bathes the mental, lingual, zygomatic and anterior auricular nerves as they emerge from the foramen ovale. When an operative procedure is to be carried out on the tongue, the floor of the mouth, the anterior portion of the mandible, to the midline of the chin, it is essential that both sides be injected. This procedure is advantageous for the reduction of a dislocated jaw.

It is important that the needle be introduced at right angles to the skin surface to avoid the possibility of the needle

entering the foramen ovale. Should this amount of solution be injected into the extradural space of the middle fossa alarming symptoms might arise. With the proper technic the needle is prevented from advancing farther when the great wing of the sphenoid is encountered.

Anesthesia of the lobe of the ear, the cutaneous and subcutaneous tissues over the mastoid region, the lateral and anterior portions of the neck from the angle of the jaw to the clavicle may be obtained by having the patient rotate the head in the opposite direction from the side to be anesthetized. This will bring into prominence the sternocleidomastoid muscle. Raise a wheal over the posterior border of the muscle midway between the tip of the mastoid and the clavicle; then insert the needle directly inward toward the transverse processes of the cervical vertebrae, for ½ to ¾ inch, depending upon the thickness of the subcutaneous tissue, and inject 10 c.c. of a 1 per cent novocaine solution. There is little or no danger of penetrating the carotid artery or jugular vein, as these lie well in under the muscle. The point of the needle with the proper technic would be at least ¾ inch from the vessels (Fig. 9). This will anesthetize the occipitalis minor, posterior auricular, superficial cervical, spinal accessory, acromial, outer, middle and internal clavicular, and the suprasternal nerves, which constitute the superficial cervicial plexus.

The anesthesia produced is sufficient for any superficial operative procedure on the neck from the lower margin of the jaw to the clavicle. The external ear is completely anesthetized. There is cutaneous anesthesia over the acromial region, and 3 or 4 inches below the clavicle. Superficial cervical glands may be removed with this anesthesia, provided they are not too close to the borders of the jaw, when it becomes necessary to infiltrate along the border of the mandible. This form of anesthesia is preferable to local infiltration for thyroidectomies, but here we are overstepping the bounds of minor surgery.

For the reduction of fractures or dislocations of the hip or femur spinal anesthesia is the anesthetic of choice, but for the arm or leg, conduction anesthesia gives us many undisputed advantages over any form of inhalation narcosis, in that:

We are able to obtain greater relaxation than with any form of anesthesia with the possible exception of deep ether narcosis.

It permits reduction under the fluoroscope without fear of spark explosions, and the operator's work is not hindered or embarrassed by a cumbersome gas-oxygen machine.

The patient is conscious and able to assist in the reduction of a fracture or dislocation.

It does not necessitate the hospitalization of patients. They may be permitted to go home as soon as the splints or caste is applied.

The anesthesia lasts sufficiently long to benumb the parts several hours after reduction. To attempt to describe a technic for all possible fractures that one might encounter would be quite impossible in this short article.

For fractures of the humerus, ulna and radius, or dislocations of the elbow, brachial anesthesia would be preferable, but unfortunately the technic is such that it is not readily understood by all practicing physicians. Therefore, an endeavor will be made to describe methods of anesthetizing parts at or above the site of fracture.

An over-riding fracture of the lower third of the humerus may be reduced by inserting the needle A (Fig. 10) through the wheal raised over the center of the biceps approximately 2 inches above the site of the fracture. This is carried around the arm in the subcutaneous tissue until the point is over the center of the triceps, 1 c.c. of solution being projected ahead of the needle for each centimeter of tissue traversed. The needle is guided by the finger tips of the left hand. The needle point is then withdrawn to the skin

surface and reintroduced in a similar manner as shown by B (Fig. 10). This raises a subcutaneous wheal that anesthetizes all of the cutaneous nerves. Should one find difficulty in introducing the needles A and B and guiding them around the arm, the same results may be obtained in anesthetizing the cutaneous nerves as shown in Fig. 12 with needles A and A′ the points of which raise a subdermal wheal through which needles B and B′ are inserted to complete the circular subcutaneous wheal. At the inner border of the biceps needle C is introduced and directed toward the posterior surface of the humerus, projecting the solution as the needle advances. When it has been inserted into the tissues 1.5 cm., 5 c.c. of solution are injected. It is then inserted in the same axis another centimeter and 5 to 10 c.c. of solution are injected. This anesthetizes the cutaneous, antibrachial and the ulnar nerves. The needle point is withdrawn to the skin surface and inserted toward the anterior surface of the humerus, and as it advances 10 to 15 c.c. of solution are injected into the tissues, to anesthetize the median and musculocutaneous nerves. The needle is then withdrawn and inserted through the skin at the outer border of the biceps directly towards the center of the humerus, until its progress is stopped by the bone. Inject 10 c.c. of solution. Withdraw the needle E to the skin surface and reintroduce it to the posterior part of the humerus; again inject 10 c.c. of the novocaine solution. This anesthetizes the dorsal cutaneous, antibrachial and the radial nerves. This technic suffices only for anesthetizing the radial nerve at the level illustrated, because at a higher level the radial nerve is internal to the humerus, as are the ulnar and median nerves. At a lower level it is external and anterior to the bone.

Ten minutes should elapse before manipulations are attempted, at which time anesthesia should be complete. When a needle is being inserted only very small amounts of the novocaine solution should be injected at a time. As the nerves are approached by the point of the needle the piston of the syringe should be withdrawn, and if blood does not appear in the barrel of the syringe the injection is made. If blood is observed in the syringe it indicates that the needle tip is within a vessel and it should be slightly withdrawn or inserted deeper before the injection is made. To avoid injecting the solution into a vein after blood is observed in the barrel of the syringe it is advisable to disconnect the syringe from the needle and expel the contents to remove the blood-stained solution. When a blood vessel is penetrated with a small gauge needle little or no harm is done. The edema produced by the subcutaneous wheal disappears by the time anesthesia is complete. One need not hesitate to apply splints or a plaster cast as the case may indicate.

To reduce fractures of the ulna and radius it is advisable to inject the anesthetic solution a couple of inches above the fracture, but should the operator feel that he is not absolutely certain of his nerve relations the injections may be made as shown in Figure 11 by raising a circular subcutaneous wheal about the arm, at the site of the fracture, with needles A and B and injecting 10 to 15 c.c. of a novocaine solution through each of the needles C, D and E, and between the fragments of the bones to anesthetize the radial, medial, ulna and interosseous nerves as shown in Figure 11, inset. This procedure similates local anesthesia in that the anesthetic solution is injected directly into the field to be anesthetized. Due to the contour of the forearm it is advisable to raise the primary wheal laterally instead of over the anterior surface as in the upper arm. The subcutaneous wheal is produced by using a 4 inch needle, which is guided through the tissues by the finger tips of the left hand (inset, Fig. 11).

Should the operator feel that he is not absolutely certain of his nerve relations the injections may be made as shown in Figure 11, by raising a circular subcutaneous wheal

with needles A and B, and injecting 10 to 15 c.c. of solution through each of the needles C, D and E, to anesthetize the radial, medial, ulnar and interosseus nerves (inset, Fig. 11).

Until one has become well acquainted with the technic often twice as much solution will be required to produce satisfactory anesthesia, that is instead of using 50 c.c. to anesthetize the forearm, possibly 100 c.c. will be required by one unfamiliar with the technic. One should not hesitate to use a quantity sufficient to produce satisfactory anesthesia.

For a fracture of the lower third of the tibia and fibula a primary intradermal and subcutaneous wheal is made as described in the arm cases. Needle C is introduced external to the tibia and carried backward and outward in such a manner that it will pass over the outer border of the fibula. About 20 to 25 c.c. of novocaine solution are deposited as the needle advances. This will suffice to anesthetize the deep and superficial peroneal nerves. There is little or no danger of penetrating blood vessels in this field. The needle is withdrawn and reinserted through the mid-portion of the soleus muscle. When it has penetrated the tissues 1.5 cm., 10 c.c. of novocaine solution is injected. The needle is then advanced until its progress is stopped by the posterior border of the tibia. When it is withdrawn 1 cm., 10 c.c. of the anesthetic solution is again injected to anesthetize the posterior tibial and medial cutaneous nerves.

To anesthetize the penis for circumcision, ureterotomy, fistula, anterior strictures, plastic operations or amputation, a wheal is raised on the base of the penis below the pubic spine. A 2½ inch needle is bent in a semicircle, similar to a half-curved surgeon's needle. The penis is held in position with the left hand. The needle attached to the syringe is introduced through the wheal and carried down to the corpora cavernosa on the right side. Three to 4 c.c. of novocaine solution are injected (Fig. 13). The needle is then guided around the penis, projecting 1 c.c. of solution for each centimeter of tissue traversed to the raphe. The needle point is withdrawn to the skin surface. The skin including the wheal is displaced slightly to the left. The needle is reintroduced as before and a subcutaneous wheal made on the left side to the raphe, to meet the wheal produced on the right side. These injections block the dorsal nerves of the penis and their branches (Fig. 13 A). For a simple circumcision satisfactory anesthesia may be secured by raising a wheal on the dorsum of the penis midway between the symphysis and glans, and through this the curved needle is introduced to the right. Five to 6 c.c. of solution are used to produce a subcutaneous wheal on the right side. The needle point is withdrawn to the skin surface and a wheal is produced on the left side in a similar manner (Fig. 13 B).

All operative procedures upon the hands may be performed painlessly by anesthetizing the cutaneous, ulnar, median and radial nerves at the wrist (Fig. 11). If an infection or cellulitis of the hand exists it is preferable to produce the anesthesia well above the infected region in order not to contaminate the healthy tissues. For severed tendons the anesthesia should be produced high enough to enable the operator to dissect out the retracted tendon. When the parts are not infected it is advisable to anesthetize only that part of the hand or fingers upon which the surgical procedure is to be carried out. The fingers may be anesthetized above the metacarpophalangeal articulation. If, for instance, the index finger is to be anesthetized a wheal is raised on a dorsal surface of the hand above the metacarpal articulation. The patient's hand is held by the operator's in such a manner that the surgeon's fingers are in the patient's palm. The thumb of the left hand glides the skin containing the wheal toward the thumb. A 2 inch needle is inserted through the inner border of the wheal, and so adjusted that the bevel faces the

metacarpal bone. It is then passed along the side of the bone slowly injecting the solution as the needle advances. When the point of the needle is felt by the operator's fingers on the palmar surface a subcutaneous wheal is raised with 2 or 3 c.c. of solution. The needle is then withdrawn again slowly injecting the novocaine solution. The patient's skin is pushed outward and the needle is rotated so that the bevel faces the outside of the metacarpal bone. It is again introduced until the tip is felt by the fingers in the palm, injecting 3 or 4 c.c. of solution as the needle proceeds (Fig. 14). Four to 6 c.c. of a 1 per cent novocaine solution should be injected on each side of the metacarpal bone. The needle should never be permitted to penetrate the palmar surface of the hand. If two or more fingers are to be anesthetized a subcutaneous wheal is raised on the back of the hand, and subsequent injections made through this wheal as shown in Figure 15. Five to 7 c.c. of a 1 per cent novocaine solution should be introduced into each interosseous space. After the injection is made the hand should be gently massaged to disseminate the novocaine solution. Anesthesia should extend to the finger tip in five to six minutes. It is inadvisable to attempt any operative procedure until the tip of the finger is completely anesthetized. Twenty-five to 35 c.c. of a 1 per cent novocaine suprarenin solution should be sufficient to anesthetize all of the fingers.

To anesthetize an individual finger a wheal is raised over the base of the first phalanx. The patient's finger is held by the operator as shown in Figure 16. The skin and wheal over the base of the finger are pushed outward by the thumb 2 to 3 c.c. of solution are slowly injected as the needle advances until the tip is felt by the fingers of the operator. The needle is withdrawn, the skin and wheal are retracted inward by the thumb of the operator, and 2 to 3 c.c. of solution are injected in a similar manner on the inner side of the phalanx (Fig. 17). Care should be taken not to inject too much solution as this may produce a constriction about the finger and impair circulation. If the tissues are too much edematized or if too great a constriction is produced, necrosis of the tissues may be produced. When injections are made around or about a bone the bevel of the needle should be in apposition to the bone. If the point of the needle is directed toward the bone it may penetrate the periosteum or catch in the bone, bend or break the point, or possibly break the needle.

Anesthesia of the feet or toes may be produced with a very similar technic to that of the hands. If an operation for hallux valgus has once been performed with conduction anesthesia I doubt very much if the operator would ever use any other method. The patient is conscious, the motor function is not disturbed and when the operation is completed the operator is enabled to observe the function of the joint.

Raise an interdermal wheal 1½ inch above the metatarsophalangeal articulation. Attach a 2½ inch needle to the syringe. The operator places his fingers under the sole of the foot and the thumb displaces the wheal outward over the first interrosseous space. The needle is introduced through the wheal. Five to 7 c.c.s of a 1 per cent novocaine solution are injected as the needle advances to the plantar surface. The needle is withdrawn, the thumb of the operator retracts the wheal to the inner surface of the metatarsal bone. The needle is then inserted to the inner side of the metatarsal bone (Fig. 18) and an equal amount of solution injected. As soon as the solution penetrates the skin it anesthetizes the dorsal cutaneous nerves; the peroneus nerves are encountered opposite the dorsal surface of the metatarsal bone, (Fig. 19); the needles approximate the medial and plantar nerves on the sole of the foot as shown in Fig. 18, inset. If the entire foot is to be anesthetized the technic is similar to that of anesthetizing the hand. The needles are inserted

through the interrosseous spaces as shown in Figure 19. The technic for anesthetizing a single toe is as simple as anesthetizing a finger. The great toe, due to its size, necessitates the raising of two wheals internal and external to the tendon (extensor hallucis longus). Two to 3 c.c. of a 1 per cent novocaine solution are injected on each side of the phalanx (Fig. 20).

The other toes may be anesthetized from a single wheal raised on the dorsal surface; 1.5 to 2 c.c. of solution on either side of the bone will be sufficient to produce complete anesthesia.

It is hoped that these suggestions will be of some assistance, in minor surgery, to the isolated practitioner, industrial surgeon and those members of the profession who are not familiar with novocaine anesthesia.

Picture a patient fighting, gagging, coughing, suffocating and cyanotic from inhalation narcosis, as compared to the patient who is comfortable, at ease, laughing and talking with his doctor doing the operation.

Try and visualize the patient's discomfort for the first twenty-four hours following general anesthesia, as compared with the one that has had all of his fingers amputated with conduction or local anesthesia, who is permitted to go home and eat a hearty meal.

Should a patient be subjected to the possibilities of anesthesia nausea, vomiting, distention, bronchitis, pneumonia, lung abscesses and innumerable other narcosis complications, when they may be avoided? Would you submit to ether anesthesia to have an ingrowing toe nail removed? No. Then why compel a patient to take it.

Why have thousands of physicians adopted local conduction and spinal anesthesia in the last few years in preference to inhalation narcosis? Because it is safer.

THE USE & ABUSE OF ANTISEPTICS*

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THERE is still great variation of opinion as to the value of antiseptics. The most blind faith appears amongst those chemical manufacturers who send round advertisements showing how easily microbes can be killed by the particular antiseptic they are recommending. The extreme form of scepticism is found among certain laboratory workers who contend that it is the physiological response of the body tissues, and not the antiseptic, which kills the microbe. Between these extremes come the clinicians who vary from the conscientious believer in the efficacy of antiseptics, to the perfunctory user who has little faith in their value. Very few have a discriminating judgment in the matter. This is not to be wondered at since clinical and laboratory evidence often appear to contradict one another, and principles have been neglected for rule-of-thumb practice. Before trying to estimate the true value of antiseptics, one must cast aside some of the commonly employed untrustworthy criteria. Little reliability can be placed on experiments showing the power of an antiseptic acting in a watery medium, for in the body it has to act in a serous fluid. Nor can one make a true judgment of its effect on microbes in the wound without at the same time allowing for the extent of its deleterious action on the body tissues, the speed with which it acts, and the type of wound to which it is applied.

The contrast between the aseptic and the antiseptic schools is a false one, and the founder of antiseptic surgery fully

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appreciated the value of both methods. Lister's aim was to produce an aseptic wound by antisepsis, but he quite realized that where infection was minimal, aseptic technic could produce as good results as the antiseptic method. He wrote "These two great truths have been taught us by advancing science, that normal serum is not a good soil for the development of attenuated microbes and that bacteria introduced among the tissues, if in not too concentrated form, are disposed of by phagocytosis." Those who stress the damage done by antiseptics to the tissues are only following the lead of Lister who wrote: "In treating surgical cases antiseptically I always endeavour to avoid the direct action of the antiseptic substance upon the tissues, so far as was consistent in the existing state of knowledge with attaining the essential object of preventing the development of injurious microbes in the parts concerned."

It will serve to clarify our ideas if we consider the subject with reference to the different varieties of wounds which for our purpose may be classed as:

1. Clean.
2. Contaminated.
3. Deeply infected (including nearly all gunshot wounds).
4. Granulating.

A few words may finally be devoted to the action of antiseptics on microbes dwelling on intact surfaces.

1. The clean wound is one made under aseptic conditions by the surgeon, or made accidentally with so little chance of contamination that for practical purposes it may be deemed sterile. Such wounds do not need the application of any antiseptic, though every effort must be made to maintain the aseptic state by seeing that everything which comes in contact with the wound is sterile. Gloves, dressings and suture materials must be sterile.

2. The contaminated wound is one in which pathogenic organisms have been planted on the surface, but have not had time to grow out into the tissues. Can antiseptics destroy the bacteria in such a wound? If so, for how long after the contamination is such a destruction possible?

Experimental work on this problem is apparently contradictory. On the one hand Fleming[1] made glass tubes with special recesses, and found that microbes planted in the recesses were not killed by antiseptics placed in the tube. On the other hand Carl Browning[2] and his coworkers experimenting on guinea-pigs found that acriflavine solution applied to a subcutaneous pocket planted with virulent bacilli, always killed the organisms, provided the strength of the solution was as much as 1:1000, and the application was made within two hours of the bacterial implantation. These experiments were controlled. The final judgment in this matter should rest with the clinician, but there are suprisingly few scientifically accurate clinical observations recorded. Fortunately it was in the recently contaminated wound that Lister first demonstrated the value of antiseptics. In his first communication on the subject, Lister recorded 11 cases of compound fracture. In 2 he does not mention how long after the infliction of the wound the application of the antiseptic was made, but in the other 9 cases full details are given. Suppuration occurred only in 2 cases in which the antiseptic was applied respectively four and six hours after the accident. No suppuration occurred in the other cases which were more promptly treated, nor did infection gain a hold in one small wound treated six hours after the injury. We think the results of general clinical work bear out the view supported by Lister's original record and Browning's later experiments, that contaminated wounds treated adequately by antiseptics, within four hours of infliction, do not suppurate. This means that the casualty department should be run on antiseptic lines. We have not space here to discuss the best antiseptic to apply, nor the best

[1] Fleming, A. *Brit. J. Surg.*, 7: 99, 1919–1920.
[2] Browning. *Brit. M. J.*, 1: 73; 2: 70, 1917.

method of application, but it is important to insist that the dressing to the wound should be large enough and impregnated with sufficient antiseptic to prevent microbes gaining access through the dressing.

3. The next class of wound is the deeply infected wound, i.e. one in which the organisms are no longer confined to the most superficial layer of the wound, but have begun to grow out into the tissues. Generally speaking, if a contaminated wound is untreated it must be regarded as deeply infected after four to eight hours. Of course it will be quite clear that a good deal depends upon the amount and virulence of the initial contamination. Nearly all gunshot wounds must be regarded as deeply infected from the first, since the force of the missile drives any organisms deeply into the tissues. This lesson was only tardily learned in the Great War.

Can antiseptics help in this group? Theoretically the answer must be very doubtful, for antiseptics which are strong enough to kill microbes would also seriously damage the tissues into which they had penetrated. But there are other factors to be considered, for it has been shown that antiseptics cause a flow of serum which is antibacterial to most organisms, though not to the dreaded streptococcus. Fleming found that in the concentrations commonly used for the treatment of wounds, most antiseptics will inhibit the growth of organisms in serum, and even in some cases kill organisms in pus, yet they at the same time retard the emigration of leucocytes, and diminish their phagocytic power. The ultimate effect of an antiseptic is therefore a complex problem. Experimenting with a chronic septic wound, Fleming found that neither the instillation of, or irrigation with an antiseptic had any great influence in diminishing the number of microbes in a wound. We accept Fleming's work as conclusive as regards most of the common antiseptics, and clinical work largely bears out his conclusions. We all know that septic wounds which are washed out with an antiseptic solution still continue to discharge pus, and any rapid improvement is as likely to be due to the natural resistance of the tissues as to the antiseptic. From this general condemnation, however, we would except the flavine and the hypochlorite groups of antiseptics. Those in the flavine group act very strongly in serum, and Fleming's experiments with them were not so convincing; while the hypochlorites have a very rapid action, cause a considerable flow of serum, and are backed by strong clinical support. In the case of most antiseptics we conclude that their chief benefit, when used to wash out, or apply to a deeply infected wound, is to ensure the sterility of the fluid used and to prevent the introduction of further organisms.

The ordinary antiseptics were proved to be of little value in dealing with gunshot wounds in the early days of the Great War, and it was because of this failure that Sir Almroth Wright sought to encourage the physiological response of the body by applying hypertonic salt solution to wounds. There is no doubt that the application of this solution causes the flow of an albuminous fluid with considerable antibacterial properties, but the leucocytes are repelled by the hypertonic solution. If this method of treatment is adopted normal saline must be applied alternatively with the hypertonic solution, so that leucocytes may be permitted to come into the wound.

The infected track of the majority of gunshot wounds is inaccessible to ordinary antiseptic applications, so that excision of the track is the method of choice when possible. After excision the wound can be treated by the physiological or antiseptic methods, preferably by the antiseptic Carrel-Dakin technic. The stuffing of antiseptic powders or pastes or even salt packs into the narrow track of a gunshot wound has nothing to commend it.

4. In a granulating wound the healthy tissues next the injured part have formed a natural barrier against infection and the rational plan for the surgeon is to do everything he can to protect those delicate granulations. They may be injured by accumulated discharges therefore drainage must be efficient; they may be irritated by foreign bodies which must be removed. They may also be seriously damaged by antiseptics and this fact should prevent the surgeon ever applying strong antiseptics to a granulating wound unless he wishes to destroy exuberant or feeble granulations.

It has been satisfactorily proved that most antiseptics have little or no effect in reducing the number of organisms on the surface of a granulating wound, so that the common routine washing out of healing wounds can have little action but the removal of debris to commend it. The only exception is that of the hypochlorites. Experiments by Parry Morgan on films of pus in vitro and investigations by Fleming on a granulating wound in vivo, show that the hypochlorous solutions are likely to have a definite bactericidal effect on the organisms on the surface of a granulating wound even if used merely as a lotion to wash the surface.

There is no need to wash out the cavity of an ordinary abscess. In relating the treatment of an acute abscess by incision and drainage Lister made the significant remark: "The antiseptic substance was never from first to last applied to the cavity of the abscess as such treatment could only have been productive of needless irritation."

We can summarize our conclusions by saying that all the evidence goes to prove that antiseptics are not needed in clean wounds, but are exceedingly valuable in recently contaminated wounds; while in deeply infected and granulating wounds they have little direct antibacterial action except in the case of the hypochlorites. The success of the Carrel-Dakin technic bears out clinically what the laboratory asserts.

EFFECT OF ANTISEPTICS ON SKIN AND MUCOUS MEMBRANES

Experimental work shows that it is exceedingly difficult to kill the organisms in the depths of the skin. It is indeed doubtful whether it is possible to sterilize skin without doing too much damage to the normal cells of the part.

This fact should enforce the wearing of sterile gloves for operations. Nevertheless though one may not be able to render the deep parts of the skin absolutely sterile there is good clinical ground for believing that some antiseptic applications are valuable for rendering the surface almost sterile. The use of tincture of iodine, picric acid solution, and some of the aniline dyes has strong clinical support, and the experiments of Lister showing that carbolic acid had a special avidity for hair makes a 1:20 or 1:40 solution suitable for application to the scalp (away from the eyes) the axilla and peri-anal tissues.

Mucous membranes are more delicate than skin and we are not aware of any reliable controlled clinical or experimental work which supports the view that microbes lodged in crypts or recesses can be killed by antiseptics. It may well be that organism which have just been planted on the mucous membrane may be killed by an antiseptic application. This would be parallel to the treatment of a recently contaminated wound and supports the practice of applying a solution of silver nitrate to a conjunctival sac recently infected with the gonococcus. But the washing out of infected mucous cavities with antiseptic solutions has little to support it other than that the antiseptic keeps the fluid sterile.

Unless the principles underlying treatment by antiseptics are understood success can only be accidental. It should be the aim of every practitioner to understand principles so as to ensure success.

DISLOCATIONS OF THE SHOULDER*

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FREQUENCY

ABOUT half of all dislocations are of the shoulder, roughly 4 in males to 1 in females, occurring at any age but with increasing relative frequency as age advances.

ANATOMICAL AND PHYSIOLOGICAL CONSIDERATIONS

The fundamental reason for the greater frequency of dislocations of the shoulder joint is that here nature has found mobility more useful than stability.

This great mobility is permitted by the peculiar construction and roominess of the capsule and by the small size of the glenoid cup covering as it does, even when expanded by the cotyloid ligament (labrum glenoidale), only about one-third of the cartilaginous surface of the head of the humerus.

An essay might be written on the question "What keeps the head of the humerus in place?" and this most interesting phenomenon not be adequately explained. Suffice it here to say that the matter is most complex, many forces and many organs taking part in it.

All the muscles connecting the humerus with the scapula, even the greater pectoral, by their tone assist and by active contraction in a sort of reciprocal relation: when one group contracts, its antagonists relax. Of these the most effective in this relation are the deltoid, and supraspinatus and the triceps; witness the ease with which dislocation occurs in poliomyelitic paralysis of these muscles.

The capsule is wonderfully built to permit such free motion as that of the shoulder joint and yet make important, perhaps the largest, contribution to its stability.

Atmospheric pressure is given the major place by some, but atmospheric pressure can become effective only in case a vacuum is formed in the joint. If such were present it would soon be filled with serum and blood and the pressure would cease, but if any force pulls the head of the humerus away from the glenoid such a vacuum is instantly formed. In other words atmospheric pressure is ready to resist any such motion though it does not maintain pressure otherwise. Atmospheric pressure does not prevent the weight of the arm producing a subluxation in deltoid paralysis.

Much the same can be said of capillarity though it may well be that this force deserves the major position; witness the adhesion of "optically" perfect surfaces anywhere; the lung to the chest wall (Macewen), the lids to the eyeballs, the boy's famous "sucker" to the cobblestone.

CLASSIFICATION

Most classifications of shoulder dislocations are based on the positions in which the head of the humerus comes to rest, secondary positions, but a clear understanding of the etiology and therapy requires knowledge of the primary positions i.e., the positions of the head of the humerus as it leaves the socket and thence the location of the rent in the capsule and other damage done.

Well over 90 per cent of all dislocations of the shoulder are primary subglenoid displacements in front of the triceps tendon.

Primary posterior dislocation is next in frequency but is not common, in fact comprising not over 2 per cent of all dislocations of the shoulder. The head of the humerus may go out between the tendon of the triceps and the teres minor but may be above the latter, coming to rest under the acromion or under the spine of the scapula, generally complicated

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by tearing off of the subscapular muscle or the lesser tuberosity.

The secondary or final positions of the head of the humerus are many. The principal anterior dislocations are, in order of frequency: subcoracoid, subglenoid and subclavicular and the rare *luxatio erecta*. Posterior dislocations are described as subacromial and subspinous with the rare, even disputed subtricipital dislocation, the result of internal rotation of the shaft with pressure backward, comparable to the reversed anterior dislocation of the hip.

MECHANISM

In the laboratory the humerus may be readily dislocated by a heavy blow struck in a downward direction on the upper part of the abducted arm and posterior dislocation may be producted by forced internal rotation with something of a blow in front. There is no doubt that dislocations as seen clinically are sometimes produced by such blows on the top of the shoulder, as in falls forward or backward, but the great majority occur as the result of leverage, often doubtless with some thrust added.

Abduction of the shoulder is normally limited by tension of the lower portion of the capsule, balanced by compression of contact of the head of the humerus with the glenoid. If abduction be forced beyond the limit something must give way; the surgical neck of the humerus, the neck of the scapula, the greater tuberosity which impinges on the upper border of the glenoid or the capsule of the joint.

The capsule may yield in its continuity or it may be avulsed at its insertion at the edge of the glenoid or at the neck of the humerus. Most commonly it is torn in continuity in its lower portion, perhaps because the curvature of the head of the humerus is greater there than elsewhere. The greater tuberosity comes into contact with the upper edge of the glenoid, to which point, therefore, is instantly transferred the fulcrum or center of rotation which is normally at the center of the head. The short arm of the lever is thereby lengthened so that further abduction forces the head of the humerus out of the rent in the lower limb of the capsule and lifts its surface away from that of the glenoid. The protrusion is made still greater by the fulcrum being transferred to the acromion or the coraco-acromial ligament, for in further elevation of the arm or further abduction the surgical neck of the humerus comes into contact with the one or the other. Even slight thrust will now serve to throw the head of the humerus completely off the glenoid into the axilla.

This mechanism is that of an exceedingly common accident; people fall forward or sidewise, throw out their arms for protection, the arm, inadequate to overcome the momentum of the body, is forced into exaggerated elevation or abduction. In the former the acromion or coracohumeral ligament becomes the fulcrum, in the latter the greater tuberosity at the edge of the glenoid. But since hyperelevation in the sagittal plane ordinarily occurs with the arm in internal rotation, the greater tuberosity is thrown against the edge of the glenoid even in this motion.

When the arm is brought down to the side the head takes its so-called secondary position. Since the majority of falls producing dislocation are forward, the arm is forced backwards, the head is thrown forward and inward, the degree of mesial displacement depending on the force of the longitudinal thrust.

Thrust with the arm in full extension is the cause of the interesting though rare "luxatio erecta," in which the arm is held straight up above the head. In a personal case the patient tripped on a rug and fell forward catching her extended arm on a bureau.

It goes without saying that the greater the displacement the greater must have been the laceration of the capsule. In most dislocations the coracohumeral liga-

ment remain intact and like the iliofemoral ligament determines much in the mechanism not only of production of the secondary positions of the head, but also of reduction. The same is true of the posterior portions of the capsule.

DIAGNOSIS

There should be no difficulty in making a diagnosis of any of the various forms of dislocation, but posterior dislocation was overlooked in the beginning in a considerable proportion of the cases reported and errors of diagnosis from fracture are too common. The loss of the roundness of the shoulder, Dugas' sign in anterior dislocation (inability to depress the elbow when the hand is on the opposite shoulder) positive palpation of the head of the humerus in its abnormal position, finally the *x*-ray which determines not only the fact of dislocation and the exact position of the head, but also shows complicating fracture if any be present. In dislocation the arm is generally held in elastic tension; in fracture of the surgical neck, mobility of the arm is unrestricted and the roundness of the shoulder persists. Moreover, the head fails to rotate normally with rotation of the shaft.

The careful surgeon will always assure himself, before instituting treatment, that the nerves and blood vessels are intact.

There is great advantage in having *x*-ray films taken in stereoscopic relation, for when viewed in a proper stereoscope many details can be observed which might otherwise be lost, such as the size and position of small fragments of bone.

TREATMENT

Most dislocations of the shoulder are easily reduced and without anesthetic, if taken while the tissues are still benumbed by the violence of the accident, but the difficulties of reduction increase with the passage of time until after a few weeks, they are so great as to make reduction all but impossible, even under anesthesia, and yet by using great force dislocations have been reduced even after several months.

Rarely dislocation is impossible of reduction from the beginning. Dollinger of Buda-Pesth operated on a considerable number and generally found the subscapularis muscle in the way. Cutting the muscle (and capsule) made reduction simple.

The head of the humerus may pass below and around or through the lower edge of the muscle and lie on its anterior surface, or by reason of thrust, it may pass through or above the muscle, reaching its anterior surface in that way.

The oldest method of reducing dislocation of the shoulder is by lateral traction with or without manipulation of the head. As a definite method it can be traced to Avicenna of the school of Salernum, but it is doubtless far older. It is not only the oldest method, it is really the best. It is efficient in most cases in which reduction can be effected at all, and is without danger. The method naturally has numerous modifications. One of the best is that of Stimson, in which the patient lies on his side on a cot set upon a table or chairs, his arm passed through a hole in the canvas of the cot, a weight tied to his hand. Such continuous traction soon tires the muscles and reduction is readily effected. Hofmeister does the same thing by having the patient lie on his sound side in bed or on the floor, traction being made by a cord attached to the hand of the dislocated arm and passed over a pulley on the ceiling, a gradually increased weight on the other end of the cord.

The essential element of all methods of reduction is to secure muscular relaxation. If one can pull the arm immediately after the accident and before muscular spasm has come on, reduction may be effected without the use of much force. Many a dislocation has been reduced by this means by sympathetic bystanders at the time of the accident.

While the use of great force in refractory cases was justified in pre-antiseptic days, it is so no longer. It is far preferable, less likely to do harm, to perform open opera-

tive reduction, provided, of course, that one has a reliable aseptic technic. In dislocations which are more than a few days old, adhesions have formed and these should be broken by rotation in various directions, and by abduction and adduction before attempt is made at reduction.

In our medical schools emphasis is put upon the Kocher method, in many no other is taught. The Kocher method, a development of the Schinzinger, is clever and most dramatic. Moreover, it is made attractive by the excellent illustration which has been copied everywhere, particularly the patient's expression of relief when reduction has been effected. It utilizes the untorn posterior parts of the capsule as fulcrum somewhat as the iliofemoral ligament is used in reducing dislocations of the hip. The method will undoubtedly reduce a large majority of anterior dislocations, but unless used with caution, is dangerous. I have known of several unpublished cases of intracapsular fracture of the head of the humerus, one of my own. It is difficult to realize the enormous rotatory force which one can exert on the cancellous upper end of the humerus by means of the forearm used as a lever. I believe that any dislocation which can be reduced by the Kocher method can be reduced by the method of lateral traction and with less risk.

Not less dramatic is the method of Sir Astley Cooper: traction downwards and outwards, countertraction being made with the operator's fist in the axilla or if more force be required, traction made by the operator with both hands and his unshod heel in the axilla. The traction is followed by adduction. If adduction is made before the head is disengaged from beneath the edge of the glenoid, fracture is likely to result, a longitudinal fracture running from the base of the greater tuberosity downwards, emerging on the mesial surface of the shaft. At least I have seen one such case.

OLD UNREDUCED DISLOCATIONS

In time mobility slowly increases, a new joint forms, ligaments adjust themselves so even a dislocated arm may be useful. The cases should be studied individually and treatment undertaken according to the nature and degree of disability. Many would best be left alone, others, because of pain, loss of function, should be operated upon. Some can be reduced after cutting the contracted soft parts, but with others one can do little but resect the head of the humerus.

HABITUAL DISLOCATIONS

In habitual dislocation it is often a question whether the trouble is due to faulty union of the rent in the lower part of the capsule, or to retraction and loss of support of the supraspinatus muscle. T. Turner Thomas has had good results from suturing the capsule through an axillary incision, Perthes by shortening or re-attaching the supraspinatus. Habitual dislocation may give no trouble as long as the arm is not elevated beyond the horizontal. This may be prevented by apparatus, a strap connected with a belt may suffice, as in swimming.

There are, of course, other causes of habitual dislocation than repeated traumatic dislocation with wide tears in the capsule, such as poliomyelitic paralysis, fracture of the glenoid diminishing its already small area.

COMPLICATIONS

Muscle rupture is so common as to be almost a necessary part of the process of dislocation, especially of the subscapularis, the supraspinatus is not rarely torn off its insertion, the biceps tendon may be dislodged from its groove and become an obstacle to reduction, but it is seldom divided.

Nerve injuries, sometimes with more than temporary paralysis, are not rare, also damage to the axillary vessels. I have seen gangrene of the hand from obliteration of the axillary artery in a forward dislocation of the shoulder.

Fracture of the greater tuberosity is

commonly due to impingement on the edge of the glenoid but its points of attachment of the dorsal scapular muscles are often pulled away. Stereoscopic *x*-ray films are here invaluable.

Fractures of the upper end of the humerus as complications of dislocation vary greatly in form, from transverse fracture of the surgical neck to comminuted splintering of the bone. Probably they are not all caused by the same mechanism. The most common is the transverse fracture of the surgical neck, which may occur by leverage, the abducting or extending force continuing after dislocation has occurred; the head held by untorn parts of the capsule, the edge of the glenoid, the fulcrum (Stimson's suggestion) or the surgical neck of the humerus in contact with the acromion. Dislocation complicated by fracture of the neck of the humerus, has rarely been reduced by manipulation, but it is difficult, often impossible. Then it is best to cut down on the fracture, drill a hole into the remnant of the shaft which remains on the head, passing a wire or a hook, and make traction. The head is thereby readily replaced. The wire may be used to fasten the head and shaft together.

AFTER-TREATMENT

It is common practice to bind the arm to the side for two or three weeks to favor healing of the wound in the capsule, motion being gradually increased after this date.

While complete fixation is not of great importance, fixation will at least prevent abduction in which position redislocation easily occurs. Prolonged fixation is apt to result in the formation of symptom producing adhesions, so that there are some advantages in early mobilization. Such mobilization should take the form of elevation of the arm in the sagittal plane as less likely to disturb the union of the capsule.

SIMPLIFIED TECHNIC FOR INTRATRACHEAL INJECTION OF IODIZED OILS (LIPIODOL)*

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THE generalized use of iodized oils for the diagnosis and treatment of diseases of the respiratory organs demands a technic that does not require a specialist nor complicated apparatus, and that is safe and painless to the patient.

The reason why intratracheal injections are difficult is that the instruments required are rather imposing looking and cause fear, discomfort and sometimes actual pain. The patient becomes scared and restless, consequently with certain procedures the danger of allowing some of the oil to drip in the esophagus is actually present.

The technic described here has been used several hundred times, the cases including nervous women and children, without the slightest mishap.

The technic can be considered absolutely safe and easy. *In fact the dripping of oil in the esophagus is a practical impossibility.* The patient is not scared because only an instrument resembling the plainest tongue depressor is used. Not even a head mirror or the projection of light in the throat is required.

The only instruments used are the special cannula tongue depressor and a record syringe of suitable size (10 to 20 c.c.). (Fig. 1.) The cannula tongue depressor is a metal tongue depressor adapting

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itself to the tongue closely and along which runs a metal tubing. This metal tubing projects from both ends of the

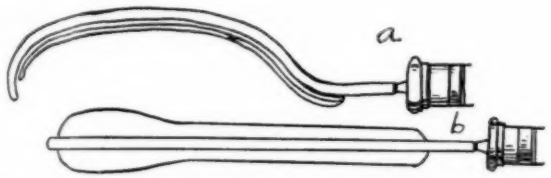

Fig. 1. Two views of cannula tongue depressor with tip of syringe attached.

tongue depressor: The end that comes in contact with the posterior aspect of the tongue is bent to such an angle and projects enough to engage itself into the epiglottis. The other end is adapted for insertion of the record syringe, containing the iodized oil. (Fig. 2.)

The procedure recommended is the following:

Fig. 3. *X*-ray of patient fully dressed while iodized oil is poured into trachea. Note how it is impossible for iodized oil to drip into esophagus.

The patient sits erect and is told to open his mouth and push the tongue forward.

The throat is anesthetized by dropping slowly (drop by drop) on the back of the tongue 20 per cent watery solution of novocaine, either with pledgets of gauze held by any forceps or by a syringe to which is attached a suitable tubing. It is advisable never to touch either the tongue or the palate directly but allow the

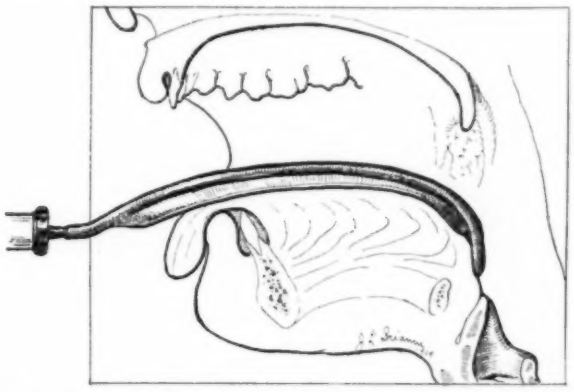

Fig. 2. Cannula tongue depressor shown adapting itself to whole tongue while tip of metal tubing becomes engaged in epiglottis.

solution to drop on the tongue. This because some patients gag and cough

Fig. 4. Iodized oil in bronchi.

very easily and persistently when the posterior aspect of the tongue or the palate is touched. In a few minutes the posterior aspect of the tongue, the epiglottis and the larynx are anesthetized. In order to make sure that the anesthesia is satisfactory, ask the patient if he feels that his throat is numb, if so apply the cannula

tongue depressor and if no reaction follows you can safely start the injection.

(The syringe has been previously filled with lukewarm iodized oil and inserted into the cannula.)

As seen by the illustrations the cannula tongue depressor adapts itself closely to the tongue. The curved tip is engaged in the epiglottis. (Figs. 2 and 3.) All that is needed is to gently press the cannula tongue depressor on the tongue while gently pulling it forwards. Thus you are sure that in pulling the tongue forwards the tip of the cannula tongue depressor is and remains engaged in the epiglottis. Consequently with the organs properly anesthetized *it is a physical impossibility to cause dripping of oil into the esophagus even if the patient moves the head.* (Figs. 2 and 3.)

The injection will be more successfully and easily accomplished the less the patient has been frightened. You tell the nervous patient that you only want to apply the tongue depressor on the tongue. (You do not even need to look into the mouth); the actual injection then requires so little time that the patient will be most agreeably surprised to know that the whole procedure is over before he thought it had been started.

By the method described injection of iodized oil has become such an easy procedure that we do not even require our patient to undress or open their collars, when the latter are not too tight.

If it is desired to inject only one lung, all that is necessary is to have the patient lean slightly on the side which should be injected.

BURNS*

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BURNS are unexpected accidents and their sudden occurrence finds the victim and his comrades unprepared to meet the emergency. The first aid that is given is very important in the later treatment. The agents causing the tissue reaction or destruction are many: dry heat, moist heat, chemicals, mechanical friction, *x*-ray, actinic rays and electricity.

In each case there is a destruction of tissue, or a tissue reaction, and its influence on the human body will be directly proportional to the amount of toxin absorbed. The amount of toxin absorbed will depend on the area of the body involved. It is an old clinical observation that if one-third of the body area is involved, the prognosis is grave and often fatal. Children do not tolerate burns so well as adults; and with them, burns of the face, neck and head, as well as burns of the large serous cavities, are more serious. The damages caused by burns, whatever the degree, are destruction of tissue, the formation of toxins, and the presence of secondary infection with the development of other toxins. These toxins are quickly absorbed, and the body has to take care of them. The circulation carries these toxins to the liver and kidneys, and they are eliminated through the kidneys. The kidneys show impairment by a reduction in the amount of urine and the presence of albumin, casts, and red blood cells in the urine.

The problem that presents itself in the treatment of burns then is the following: first, the prophylaxis; second, the emergency treatment; third, the treatment of toxemia; and fourth, the treatment for replacing the lost tissue.

The prophylactic treatment is lay educa-

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tion for the innocents and the educated: first, that fire will burn; and second, what will make fire. This has been carried on, but still there are people who will light a match to see if their gasoline tank is full.

The best emergency treatment is to summon medical aid, or take the patient to a hospital where proper aid can be given. The use of water on burns with different ingredients to relieve the pain and burning is a poor procedure, because this may wash off some of the toxins; also it will bring in more infection and, by moistening the destroyed tissue, aid in the absorption of the toxins. For the relief of pain, the clothing which causes pressure or dragging on the damaged area should be removed and then a 2.5 per cent solution of tannic acid should be applied by means of a spray every fifteen minutes until the destroyed tissue assumes a tan brown color and a coagulation takes place. Covering the burnt area will ease the pain, shut out infection and catch all the toxins in the coagulum and prevent their entrance into the body. During this procedure the body should be kept warm and symptoms of shock combated by means of warm drinks, such as coffee or tea, and the injured person kept flat on his back or side, depending upon where the burn is. In addition, morphine in sufficient doses should be used to relieve the pain.

Shock and toxemia have to be combated. Even if the coagulum takes care of most of the toxic products, there will be some absorbed, and shock in varying degrees will be present. The recumbent position, or lowering the head of the patient, the maintenance of the external body heat, and the administration of fluids will combat shock and aid the body in eliminating the toxins. What fluids are the best? It is our practice to give our first fluids intravenously in order to give the patient immediate benefit. This is done where there is a moderate degree of shock. Six hundred cubic centimeters of a 5 per cent glucose solution are given. This seems to increase the blood volume, dilutes the toxins, and brings 120 calories of available energy to the body. Normal saline solution is given as proctoclysis. The degree of shock and its persistence or improvement is determined by means of blood pressure readings every fifteen minutes, watching the pulse rate, and the general condition of the patient until there is an improvement warranting a greater interval. The effect of toxins on the body is watched through the urine. The total twenty-four hour output, and its complete examination, compared with the twenty-four hour intake will give fairly accurate evidence as to the degree of absorption and the influence on the kidneys. By the use of this method, where there ordinarily is scanty, high specific gravity urine with the presence of albumin, casts, and red blood cells, we find an almost normal urine. This method combats the absorption of toxins through their being caught in the coagulum. Infection which may enter is at a minimum, since absorption is prevented when the toxins are shut off from the capillary system. Shock and what little absorption might take place are treated with glucose and saline solutions. The vicious circle present in the older forms of treatment is broken by almost completely eliminating the toxic products that follow thermal destruction of body tissue. The reason for not using any oily solutions in the emergency treatment is self evident. If an oily solution is used first, the aqueous solution of tannic acid will not be able to permeate the destroyed tissue so completely, and more absorption will take place.

The repair of tissue defects and restoration of function are very important. The restoration of function should always be in mind from the very beginning. Limbs should be placed in the proper positions, but that alone is not sufficient. As healing takes place, the limbs that were in proper positions are soon drawn into improper positions. Hence constant care must be exercised. The closure of defects may be greatly aided by timely grafts of skin,

either Thiersch, Reverdin, or whole thickness of skin. The sooner this is done, the better the result will be. As soon as the coagulum is ready to fall off, there is a bed of granulation tissue. This will immediately become more heavily infected if not protected. Our practice has been to use hot boric and alcohol dressings, changing them every four hours until the granulation has developed a healthy red color. The night before the graft is to take place, the whole area is painted with one-half strength iodine solution and a dry dressing put on. This dressing is removed the next day, and Thiersch grafts are laid on. These grafts are covered with a wire cage, and sterile gauze is placed over the cage. It is not changed for twelve days. Then the crusts of serum are removed and the field is almost entirely covered with new skin. After this just a dry dressing is used; or, if this sticks, a boric ointment dressing is used instead. To obtain a complete return of function where it is impaired will necessitate careful medical care. Massage, exercises, and plastic operations should all be used at appropriate times and when indicated.

PESSARIES IN GYNECOLOGY*

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THE art and practice of medicine is in continual flux—new ideas and methods supplant the old, as it should be, but occasionally a good method is lost sight of in the seeking of the new, and this we find to be true in the use of the pessary. It has been described as a "lost art," and one has only to scan the various medical indices to be appraised of this fact, for today there is hardly an article written on the use of the pessary, while twenty years ago, thousands of printed pages sought one's attention.

The decline in the use of the pessary can be traced in large measure to the wide field that a more perfect operative technic has opened, to a consequent limiting of the indications for the use of the pessary, to a more proper interpretation of pelvic pathology and to a crowded curriculum in the medical school, this teaching often being of a more scientific nature, replacing in turn methods that perhaps are at times empirical and unscientific, and yet of inestimable value to the specialist and general practitioner.

In the days gone by many a heated argument was heard as to whether a pessary is a lever, a crutch or what-not. In order that we may not transgress to useless polemics, let us state that it may be at times any of the things that its old protagonists proclaimed, but above all, it is a support, and if we consider it as such, the indications of its use and the contraindications thereof can be the more easily evaluted.

The pessary has also been the cause of verbal wars, not only as to the material it should be made of (wool, hair, thread, silver, gold, platinum, horn, bone, wood, celluloid, hollow tin, German silver, glass and rubber in all its varieties, and still the list is not exhausted), but also the shape it should assume, so that in a catalogue of years gone by there were pessaries of every shape and size made of many different materials and all bearing a separate and infallible promise, the name of the man who devised that particular shape or added that particular curve, so that the poor doctor, with his many and varied duties, instead of becoming a pessaologist, became a pessimist, and

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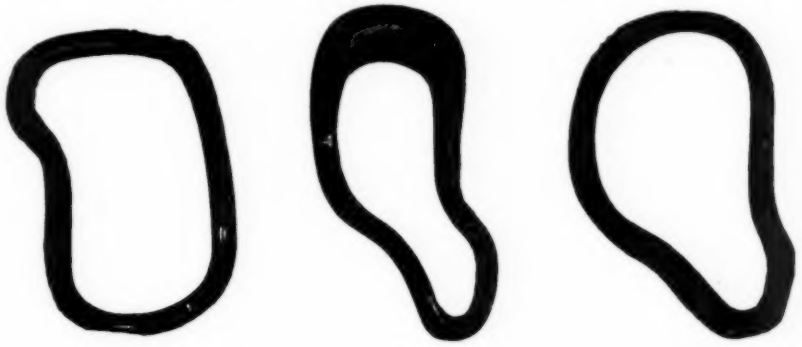
perhaps another reason added why the pessary has lost caste. At the start let us say that we shall not give you a long galaxy of names, famed for their pessaries, but rather to point out that each and every pessary must bear the imprint of the doctor using the same.



A B C

Fig. 1. A. Hodge pessary. B. Albert Smith pessary. C. Thomas pessary. (From Crossen's "Diseases of Women," C. V. Mosby & Co.)

What then can we say in defense of a practice that has in many ways been relegated to the ground of "has been?" Only this, that a pessary when properly applied in the proper case is a most valuable aid, not only to the patient but to the doctor, relieving pain and discomfort, and at times enhancing a more normal physiology, resulting in turn in a cure of the condition complained of; and, furthermore, it is a most servicable aid for those cases on whom an operation is not advisable, whether it be for age or constitutional illness, etc.

It might prove of interest if we quoted the opinion of one of the masters in the not too antiquated past. I quote from "Diseases Peculiar To Women" by Dr. H. L. Hodge, 1860:

> The long experience of the author in the use of pessaries will perhaps justify the expression of his opinion . . . that the local symptoms of weight, pain, etc., the leucorrhea, the menorrhagia and the dysmenorrhea, and all the innumerable direct and indirect symptoms of spinal and cerebral irritation, including neuralgia, nervous headache, nervous affections of the larynx, lungs, heart, stomach, bowels, etc., as also spasms, cramps and convulsions, may often thus be dissipated; that the intellectual and spiritual being may be elevated from the lowest states of depression, bordering on melancholy, or be delivered from the highest degree of maniacal excitement; and that the whole economy may thus be revolutionized.

Quoting further on the reflex influence of the pessary at the time of introduction: "'Oh, Doctor!' exclaimed a cheerful and intelligent lady, 'you hurt my neck, my shoulder, my side, my knee,' and all this in rapid succession, each spot being relieved before the other was involved. Another exclaimed on the removing of an instrument, 'Doctor, you hurt me.' 'Where?' 'At the top of my head.'"

Today that sounds not unlike an advertisement for some patent cure-all, but when we consider that operations in 1860 of even a minor character were fraught with grave risk, it is not hard to find a reason for their enthusiasm, and should indeed make our indications most modest indeed.

The word "pessary" is an old one, being derived from the Greek πεσσός and designating a curved stone that was used in playing a game something like our shuttleboard. Later it was used to designate a plug of wood or lint, steeped in medicinal substances to be introduced into the vagina or anus, etc. This definition still holds good for our medicated pessaries, and, at a still later date, to designate a support for the weakened pelvic structures.

In what type of case is the pessary

indicated? Broadly speaking, any type of case in which the pelvic support is inadequate, allowing in turn the uterus to depart from its own anatomical integrity or the bladder to herniate.

These cases can be further classified as:

1. Constitutional.
2. Acquired.

And in passing will say that it is from the latter that the larger number of cases are obtained.

Remembering the afore-mentioned broad classification, remembering that the pessary is but a support for the most part, but seldom producing a cure, we must limit our indications to those cases on whom a permanent cure (operative?) is not advisable:

1. Constitutional causes, such as old age, debility, tuberculosis, etc.
2. Marital, because an operation may interfere with the patient's fertility (post-operative inflammation), but more important pregnancy will most often undo what an operation has done, therefore necessitating another operation. And while we are remembering, *note:* that operations, of this type carry a definite, small to be sure, mortality, not speaking of morbidity with its often invaliding results.
3. Those who refuse operations.
4. Therapeutic.

Before passing to a consideration of the cause and the type of these anatomical deviations, it is well for us to keep some simple picture of the anatomy concerned, and I have borrowed from Crossen's "Operative Gynecology," as epitomizing this subject most clearly and briefly:

> The pelvis is spanned by two planes of supporting tissue, one above the other. Each plane is attached to the pelvic wall practically all the way around, so that it forms a fibro-muscular diaphragm with sling action transversely and diagonally as well as antero-posteriorly.
>
> The lower plane or diaphragm lies principally below the vagina and consists of the levator and muscle of each side, with its fascial sheath formed by the recto-vesical fascia above and the anal fascia below, and supplemental muscular and fascial structures in front and behind. Of the three openings through this fibro-muscular support, the rectal opening is well protected by the sharp bend in the canal and by the superimposed sphincter muscles below, while the urethral opening is protected by the narrowness of the canal and its situation immediately under the resisting bony arch. The vaginal opening is the weak area in the pelvic floor. Under normal conditions it is fairly well protected (a) by its situation, well forward, out of the line of direct pressure; (b) by the direction of the canal being such that intra-abdominal pressure tends to close it instead of open it; and (c) by the overlying upper fibro-muscular plane and body of the uterus.
>
> The upper plane or diaphragm lies above the vagina and comprises two segments—the uterine segment and the vesical segment. Each segment consists of a viscus and its surrounding supports. The uterine supports in the upper plane are (a) the broad ligaments, laterally, (b) the utero-sacral ligaments, posteriorly, (c) the utero-pubic fascial plane, anteriorly, and (d) the fibres between these, extending diagonally from the uterus to the pelvic wall and completing the fibro-muscular diaphragm. Each broad ligament contains an upper and a lower band or condensation of supporting tissue (connective tissue and scattered muscle fibres). The lower collection, extending from the cervix outward and upward to the pelvic wall near the "white line," is much the stronger of the two. In fact, it is so important that it has been called the "ligamentum cardinale" of the uterus. The bladder supports in the upper plane are the utero-pubic fascial plane and the banks of this tissue extending from the bladder to the uterus and to the broad ligaments along the ureters and to the pelvic wall and to the pubic bones. Both the uterine and vesical segments receive support, also, from the intact lower plane.

In addition to these two strong supporting planes, which directly resist intra-abdominal pressure, there is another factor which has much to do in maintaining the integrity of pelvic support. The factor is the deflecting mechanism, by which the force of intra-abdominal pressure

is deflected from the weak area and distributed over the supporting planes. This mechanism depends upon the normal

Fig. 2.—Introducing pessary. Index finger is passed to top of posterior end, which is then depressed until it can be pushed past cervix, as shown in Figure 3. (From Crossen's "Diseases of Women," C. V. Mosby & Co.)

anterior position of the corpus uteri. When the uterus is displaced backward, the deflecting mechanism is disarranged. This is one reason for the importance that attaches to backward displacement of the uterus. Aside from the symptoms caused by retrodisplacement and its complications, there is this disarrangement of the deflecting mechanism, which, in the child-bearing woman, usually leads to serious loss of support sooner or later. With the uterus in normal position, the intra-abdominal pressure is received on the posterior surface of the organ and distributed over a wide area of the supporting planes. Even though the vaginal opening has been enlarged and weakened considerably, it is protected from the abdominal pressure by the broad, firm deflecting surface just above. The greater the pressure from above, the more firmly is the protecting corpus uteri pressed over the opening. Again, as the corpus uteri is pressed downward and forward the cervix is pushed backward, putting the vaginal walls on the stretch and approximating the same, and thus still further providing against protrusion at the vaginal orifice.

When the pelvic floor has been torn

Fig. 3.—Introducing pessary. Posterior end depressed and being pushed past cervix. (From Crossen.)

and the uterosacral ligaments stretched so that the cervix comes low and the corpus uteri goes back, the whole mechanism, by which the intra-abdominal pressure is resisted by the two planes, is disarranged and the uterus and bladder and anterior rectal wall are gradually forced down.

In reviewing the causes of these anatomical deviations, we find but few, but these few are very definite: (1) Constitutional: Almost any condition that causes weakness and asthenia. (2) Increased intra-abdominal pressure: Occupation, play, cough, corsets, binding after delivery, sub-involution, tumor and cysts, trauma, etc.

1. Constitutional. Consult an internist to determine whether the so-called constitutional weakness is a necessity or not.
2. Increased intra-abdominal pressure.
   (a) Occupational. Needless to say, in advising a patient to change her occupation, it is with the knowledge that even an operation offers no guarantee of a permanent cure.
   (b) Play. Discontinue.
   (c) Cough. It would be indeed folly

to treat a pelvic condition, perhaps a minor one, without determining the cause of a persistent cough, for here often many of the symptoms complained of, despite a departure from a normal anatomical integrity, will be remedied by curing the cough, thus stopping the unceasing change in pressure to which a chronic cough subjects the pelvis.

(d) Constipation. One could write at length, even though at variance with some of our leading gastoenterologists, but bear in mind that the pelvic organs are in intimate association with the sigmoid and upper rectum, and despite the fact that no constitutional ill-effects may be detected at times from the constipation, yet the pelvic distress may be due in part or in whole to this very thing. Also, constipation usually means straining at stool, and thus a marked increase in intra-abdominal pressure is brought about.

(e) Corsets. The passing styles indeed can play a part, as it is rumored that with the event of the long skirt, corsets with bones (and they allow less play than the others and caused increased intra-abdominal pressure) are essential to produce the true "feminine lines." A short time ago the "boyish figure" was the approved style.

(f) Binding or tight girdles after parturition. But rarely and then only where the integrity of the abdominal wall has been destroyed is there any indication for such treatment. Postpartum exercise early and late is the best method to insure a good abdominal wall, and in turn aid in the proper involution of the uterus.

(g) Subinvolution. The cause: usually lack in postpartum attention, such as exercise, posture and a proper appreciation of the size the uterus should be, and, the speed at which involution should proceed.

(h) Tumors and cysts. Little can be done to avoid these complications.

(i) Trauma save obstetrical. Rarely due to other than operative trauma. In many of the minor gynecological operations it is the method to grasp the upper and lower lips of the cervix with tenaculae, and that is where their function should cease, simply to fix the cervix; but it is the habit with many operators to drag on the cervix, thus pulling it, and, of course, the fundus as near the valva opening as possible. This dragging may definitely and permanently impair the pelvic support.

(j) Obstetrical trauma. Despite the fact that some authorities say parturition is a pathological process, we still feel that "intelligent watchful waiting" is another aid in our prophylaxis against the solution of normal pelvic continuity.

Thus in a brief review of the more common causes of these departures from the normal we see that much in a prophylactic way can be done by proper advice, instruction and technic.

With what anatomical deviations are we concerned? Briefly, those in which the axis of the uterus has been changed and where the level of the uterus, i.e., the body and cervix, departs from normal; deviations of the uterine axis as a whole and not as a part, i.e., versions of the uterus and not flexions; the level of the uterus as judged by the tip of the cervix resting on a line joining the spines of the ischium or on an arc drawn therefrom. Naturally, there are exceptions to these rules, but on the whole they will serve as a guide.

We have previously stated "which allows the uterus to depart from its own anatomical integrity." This statement has been made advisedly as it is in the depar-

ture of the uterus from its congenital position to a new position that produces, as a rule, pelvic pathology and symptomatic distress.

By various authorities the position of the uterus is stated to be retroverted in 16 per cent to 18 per cent of all virgins and for these patients that position is considered as one of normal anatomical integrity. Furthermore, in these cases of congenital retroversion, discovered at examination and not an etiological factor in the patient's history, no attempt should be made to correct that which is normal for that patient.

We see then that our pessary is even further limited by this fairly large type of cases, and so it is, for the most part, in the acquired retroversion from whatever cause save tumors, in antiversion with early descensus and in all types of descensus and herniation of the bladder that the best results are obtained in the use of the pessary. The pessary in these cases acts as a support and by allowing a return of normal circulation, relieving the strain on muscle, fascia and connective tissue, tone is enhanced, involution or repair aided, and a cure at times effected.

Let us digress a moment to view in our mind's eye this action. If we draw a plane of the upper plevis on a level of the anterior vaginal wall, it has somewhat the appearance of a pear cut in its long axis. If we view it on the side, it has the appearance of the letter "s" placed in a lateral position with its curves lengthened. If the pelvis is again viewed in coronal section, we see it has somewhat the shape of a "v." This is due to the levators, and it is the levators that support the pessary, and it is on the integrity of the levators that we depend for the final support transmitted through the pessary. On the other hand, in using a pessary of the horseshoe shape the action of the levators is not only one of clasping and supporting, but also of buttressing.

For the most part, we favor the shape of the Hodge or Gehrung after one has modified it to the pelvis in consideration. Both can be bought in various sizes, but, because each vagina varies in length, breadth, and symmetry (depending on the integrity of the levators), we favor the shaping of each pessary at the time of introduction, hence, each pessary should bear the imprint of the doctor using the same.

That the symmetry of the pelvis is important can be easily ascertained by examining a patient after a labor. We may find one side fairly normal, the other presenting definite indications of the disruption of the levators. Naturally, if a pessary is introduced without proper evaluating, this observation, it may prove a complete failure, so it is by considering each vagina to be fitted as an entity, distinct, separate and different, in that way alone will the pessary prove a success. It is true that a stock pessary may prove efficacious, but the converse is equally true.

In order that the best results may be obtained, we advocate the use of the hard rubber pessary, and keep in stock various sizes of the simple round variety. This is advised as hard rubber is the only material that is easily shaped, cheap, smooth, and, if properly cleansed, seldom shows the action of corrosion.

After an examination, at which time the use of the pessary is decided on, two or three pessaries of varying sizes are placed in boiling water (sterilizer) and allowed to soften, and then while soft bent to the required size, immediately placed in cold water, when they will harden at once. The length is best judged in the same manner that we seek to find the diagonal conjugate i.e., by introducing the first and second finger to the posterior fornix and measuring from the subpubic ligament. The width only by trial and experience.

It must be remembered that often several trials are necessary with alterations in shape and size before the ideal is attained, and the ideal pessary must fit and perform

the function assigned to be a success. Furthermore, the ideal pessary will not cause pain or distress, in fact, the patient should not be conscious of its presence and it should not interfere with normal marital relations.

The diagrams show us roughly the shape of the two pessaries in question. The first is best introduced in the oblique diameter of the outlet. After lubricating the pessary, the perineum is depressed with one or two fingers of the left hand, the pessary held in the right at the narrow anterior bar, and then inserted in the oblique diameter, so that the anterior arm will pass to the left of the urethra while the posterior arm will press down and fit in the grove formed by the union of the perineum and the right vaginal wall. Pressure down is made, and the pessary is forced gently forward until the resistance of the pelvic floor is overcome when it is gently rotated, bringing the anterior bar down and the posterior bar up. The cervix should pass over the posterior bar, in other words, lie in front of the posterior bar. Sometimes it will be found that the cervix is posterior, and then it is necessary to depress the posterior bar with one or two fingers in the vagina until the posterior bar slips behind the cervix. Your pessary is now clasped or supported by the levators, the lateral vagina walls are rendered more tense, and at the same time the utero-sacral ligaments are rendered taught and tend to pull the cervix posterior, displacing the fundus anterior. One can easily understand that with the uterus in position herniation of the bladder will also be aided, as the facial sheath that supports the bladder will be rendered more taught and the two arms of the pessary will act as a support or scaffolding.

The Gehrung pessary is easily fashioned from the round type previously mentioned. This is done by approximating two opposite points on a softened pessary. If now it is bent in the middle of its long arms, we obtain the shape of two horseshoes placed a few centimeters apart and joined at the corresponding point or its fellow. This pessary can be bought in various sizes, but with different cases so must this pessary vary, in height, in width of the two arches and the symmetry of the same. This pessary is used to its greatest advantage in herniation of the bladder, to a much less degree in early descensus. Its action is one of support of the bladder, and acts directly at the site of the torn or stretched bladder support. This pessary depends not only on the grasping action of the levators, but also is buttressed against some bundle of muscle fibers. This pessary is introduced by depressing the perineum and at the same time inserting the left heel as far as it will go easily. It is then carried posterior, and during the whole time of its introduction is rotated in a corkscrew manner so that when the heel is at rest, it will lie opposite its fellow, but on the right side, thus bringing the two arches of the pessary directly under the bladder.

In the use of the pessary, we are striving to correct anatomical deviations. There is little to be said in a controversial manner in regard to the first three indications, i.e., constitutional, marital, those who will not be operated on, but what of the fourth, therapeutic? In evaluating slight digressions of the uterus from the normal, one is at once struck by the seemingly contradictory findings. In the one case a patient with definite retroversion and prolapsus may offer no complaint, while on the other hand, one with what seems but slight laxity of the uterine support, the tip of the cervix being just below the line joining the ischial spine, may present a number of symptoms varying from pelvic complaints to definite neurological symptoms, and it is in such cases that lifting and supporting the uterus with a pessary will prove whether that is the exciting cause of the symptoms.

In order that I may illustrate this important feature, I will briefly review 2 cases. The first one complained of persistent diarrhea that had existed since the

birth of her last baby some twelve months before. It was the one symptom complained of. She was seen in the clinic after passing through various other departments without relief. The finding was just one, a uterus anterior with a departure from its normal level. Rectal examination revealed the fact that the cervix was invaginating the anterior rectal wall. A pessary was tried. The diarrhea was stopped.

Another woman presented herself at the clinic, after having been reviewed by the other departments and labeled with a diagnosis of neurasthenia. Her complaint was pain at the base of the skull and upper cervical spine. The findings here were a simple departure of level. A pessary was tried, and the patient returned without the pain. She is still under observation as she is in the child-bearing age and desires more children. The recital of these 2 cases may sound extreme, but it is only by trying, in cases where there is but slight and early departure from the normal, that we are able to evaluate a simple, single clinical finding.

The "do nots" are important in the use of the pessary. Do not insert a pessary with the uterus retroverted and expect the pessary to right the condition. First correct the retroversion manually, and if it is not correctable, it is not a case for a pessary.

Do not use a pessary in the presence of pelvic inflammation.

Do not use a pessary in the presence of vaginal inflammation.

Do not use a pessary to correct a malposition caused by tumors or cysts.

Do not allow a pessary to remain that causes pain.

Do not forget with the presence of prolapsed tubes and ovaries the pessary is not to be inserted.

Do not forget that proper exercise: knee, chest, monkey-trot, etc., is indeed an added aid.

Do not forget that when the pessary is in place the tip of the finger should be able to pass easily between the supporting arms and the vaginal walls.

Do not forget that a warm cleansing douche should be taken every day except when the patient is menstruating.

Do not forget to see your patient two weeks after the first introduction of a pessary.

Do not forget that a pessary should be removed and cleansed at least every six weeks. Do not forget that at the time of its removal, if signs of pressure are present, that it must be discontinued until such signs are absent (such signs are for the main visual); and, in conclusion, do not forget the words of the late Dr. Emmett: "The great cause of failure and disappointment in the use of pessaries lies in the fact that the vagina is expected by many to adapt itself to any instrument which may be introduced, when, in fact, it is essential that the peculiarities of each individual case should be studied."

WET & DRY DRESSINGS WHEN & HOW TO USE THEM*

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In general we are called upon to treat two kinds of wounds: clean wounds (clean in the sense that there have been relatively few organisms penetrating the skin) and those that are frankly suppurative. Cuts and lacerations, if seen in the first twelve hours, should be regarded as clean wounds for the purpose of selecting a dressing, as a very large majority should heal without suppuration. These wounds are not bacteria free but the number of bacteria is so small that normal tissue

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reaction is able to destroy the few present without the formation of pus. In applying a dressing, the surgeon can act only to prevent the invasion of more organisms from without, and to so support the tissue that bactericidal action can take place to the maximum degree. Rest to the part and heat for dilatation of blood vessels are our best agencies for the latter.

There are four major requirements for the multiplication of bacteria; namely, the organism, a media, moisture and heat. Lacking any one of these, the process does not occur. Body heat and tissue media are always present in wounds. If we attempt to reduce the number of bacteria by drugs or by washing out the wound we are seldom successful in materially eliminating them. We can, however, render the wound relatively dry. It is the most satisfactory point of attack. Dressings which prevent the invasion of more bacteria and will absorb the greatest amount of moisture and continue to do so for the longest period should be selected. We therefore use ordinary gauze. Its capillarity removes moisture and passes it to the outside where it evaporates. Any covering over gauze preventing evaporation and continuous dehydration of the wound destroys its greatest value as a dressing. Too frequently we cover a gauze dressing with so much adhesive, oil-silk, wax paper, cotton or fiber pads that absorption is insufficient to keep the wound dry and a typical incubator is produced, bacteria multiply, and maceration occurs. If additional heat is desirable to increase the vascularity in these dry wounds, it can better be applied by the use of the hot-water bag, electric light or electric pad than by impervious coverings.

I think we should consider our drugs in much the same light. Those that destroy bacteria without devitalizing normal tissue cells and at the same time inhibit their growth by dehydration or isolation are of the greatest value. In the possession of these properties, for instance, lies the value of tincture of iodine.

Just as we should attempt to keep wounds free from suppuration by properly applied dry dressings, if pus does form it must be removed from the scene of action immediately. Our gauze dressing will absorb pus as it does moisture, but to a much less degree. Either the dressing must be changed frequently or we have again the typical incubator at body temperature. It is impracticable to change dressings often enough to keep wounds dry so we substitute wet dressings in an attempt to dilute the pus and make it more absorbable. This type of dressing is only a makeshift for a more complete removal of the products of bacterial action, by irrigation or soaking, because it can be used as an ambulatory measure. Usually the dilution is sufficient to allow the regenerating tissue cells to throw off the invading bacteria. Many solutions are advocated and are of value as they promote an interchange of fluid with the pus discharge, and actually accomplish dilution. Perhaps some solutions are bactericidal, but I believe this action is secondary to the principals of drainage. The use of an impervious covering for wet dressings, while it protects the clothes and keeps the dressing moist for a longer period, too frequently produces a "poultice" action in practice in which the temperature of the part is raised, secretions retained, and suppuration speeded up.

It is better to give the patient a bottle of solution to keep his dressings constantly wet than to retain moisture by impervious coverings.

Where the skin is not broken, as in contusions, sprains, etc., relief is usually secured by any type of heat. The extravasated blood and broken-down tissue are carried away through the blood and lymphatic streams. Heat promotes this absorption. Hot wet dressings give an excellent distribution of heat and there can be no objection to impervious coverings. Here, however, it is heat which is of value rather than the wet dressing.

Low-grade infections, paronychiae, lym-

phangitis, infected hair follicles without suppuration, etc. may be treated in the same manner. Again, heat can be well applied through the agency of the wet dressing just as it can through hot solutions, the hot-water bottle or the electric pad.

In suppurative processes such as boils, abscesses, suppurative tenosynovitis, etc., where the skin is still unbroken and the infection not localized, a hot, covered wet dressing not only acts as a "poultice" to localize the infection but also softens the skin and helps the process to point. After drainage has been secured either by natural or surgical method, as already suggested, the wet dressing should be left uncovered.

In selecting a wet or dry dressing for any lesion one must decide just what is to be accomplished, whether it is protection from more infection, dehydration, removal of bacteria present, a "poultice" action or simply support of the body resistance by the use of heat. For the most part, if dressings are to be dry they should be kept very dry. If wet, they shou d be very wet and be kept wet. If compresses or "poultices" for walling off infections through the agency of heat are required, use them but do not make an incubator out of an infected wound by sealing the dressing.

OFFICE LABORATORY FOR THE SURGICAL PRACTITIONER*

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With the development of laboratory practice, its importance and necessity in diagnosis and treatment, and the opportunities for postgraduate instruction in the large cities, an increasing demand has arisen on the part of the practitioner far removed from elaborately equipped laboratories for such service. Within certain limitations, as to equipment and training, much of this work can be done in the office. The expense of such equipment and maintenance need not be large. The technical training necessary for the performance of the tests can be easily acquired, and the experience needed to read the results is soon obtained. The practitioner will probably face his most difficult problem in the interpretation of results. The solution here, however, lies in reading and the general knowledge of medicine, and can be learned by him who is willing.

To attempt to differentiate between a laboratory designed for surgery and one for general medicine, is practically impossible. Since the practice of surgery depends almost entirely on general diagnosis, especially when cases are not referred for surgical treatment after careful study, what is applicable to that specialty, also applies to medicine as a whole.

Therefore, for practical purposes, the description that follows is a general outline of the equipment and procedures applicable to the country practitioner's office, with a few omissions in deference to surgical practice.

The detailed equipment of small articles need not be itemized. They can be enumerated from the descriptions of the tests, where the names and specifications will be mentioned. Any solutions, reagents and equipment here listed may be purchased in surgical supply stores or laboratory specialty houses.

The procedures to be described have

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been carefully selected from the manual of laboratory procedure of the Pathological Department of the Jewish Hospital of Brooklyn, and are described as they are done in that institution, with the equipment as used there. For reference purposes, any one of the following volumes should be at hand: Todd and Sanford's "Clinical Diagnosis by Laboratory Methods;" Webster's "Diagnostic Methods;" Vogel and Famulener's "Laboratory Methods," or Haden's "Clinical Laboratory Methods." The interpretations and significance of the tests will not be discussed.

Extensive bacteriological examinations cannot be attempted for obvious reasons. Examination of smears, especially for gonococci and the more common organisms, can be done with a minimum of equipment and time. For this purpose the Gram stain is used. With a platinum loop a small amount of the material is thinly spread on a glass slide. The preparation is fixed by passing the slide over the Bunsen flame three times. The slide is then grasped with a slide holder and carbol gentian violet is poured over the smear. After allowing it to remain for a minute, it is poured off and replaced with Lugol solution. This is again poured off and alcohol 95 per cent is dropped on it until the violet color has disappeared. The slide is washed in tap water and stained for a minute or two with solution of basic-fuchsin. It is then blotted, dried, and examined with the oil immersion lens. The Gram-positive organisms appear black or deep purple in color. Streptococci and staphylococci are easily identified by their characteristic groupings. Gonococci are red, occur in pairs, are coffee-bean shaped and frequently are found within the leucocytes.

The examination of urine often yields information of considerable value to the surgeon. The examinations which follow are within the scope of usual office practice:

URINE

Albumin. Test for albumin by filling a 5 × 5/8 in. test tube three-quarters full with urine. The upper portion of the specimen is boiled over the Bunsen flame, 3 drops of 2 per cent acetic acid are added and the boiling is repeated. The density of a precipitate is noted and recorded as follows:

No Turbidity: negative.

Slight turbidity: very faint trace.

Next degree of turbidity: faint trace.

Then: trace.

Then: moderate trace, heavy, cloud, or solid.

Sugar. The quantitative estimation of sugar is conveniently done by pouring 5 c.c. of quantitative Benedict's solution into a 6 × 3/4 in. lipped test tube. The solution is boiled over a Bunsen flame, and while boiling, urine is added drop by drop from a Mohr 1 c.c. pipette graduated in 0.01 until a white precipitate appears. The amount of urine used contains 0.01 gm. glucose. The percentage of sugar is obtained by dividing 1 by the volume of urine used. Thus, if 0.5 c.c. of urine was used, $\frac{1}{0.5} = 2$ per cent.

Indican. Equal parts of Obermeier's reagent and urine are mixed in a 5 × 5/8 in. test tube. To this is added 1 c.c. of chloroform. It is gently but thoroughly mixed and allowed to stand for a few minutes. A blue color of the chloroform which settles to the bottom indicates the presence of indican.

Acetone. With the aid of heat, dissolve 1 or 2 crystals of sodium nitroprussiate in a few drops of water in a 5 × 5/8 in. test tube. Add 5 c.c. of urine and a few drops of glacial acetic acid and shake thoroughly. Over it layer carefully 1 c.c. of ammonia. A purple ring at the line of contact denotes the presence of acetone.

Blood. In a 5 × 5/8 in. test tube dissolve a few crystals of guaiac resin in 1 c.c. of 95 per cent alcohol. To this add 10 c.c. of urine and 1 c.c. of hydrogen peroxide and shake. A green color indicates a positive reaction.

GASTRIC CONTENTS

Acidity. Examination of gastric contents should always be performed as soon

as possible after specimen is received. The appearance of the specimen should be noted and fresh particles of blood should be looked for. The specimen is then filtered through gauze. To 10 c.c. of filtrate add 1 drop of Toepfer's reagent. A red color denotes free hydrochloric acid. From a 50 c.c. burette graduated in tenths, add decinormal sodium hydrate solution drop by drop until the color becomes a canary yellow. The amount of the solution added, multiplied by 10, represents the percentage of hydrochloric acid in terms of normal hydrate solution. To the same filtrate now add 2 drops of 1 per cent phenolphthalein solution. Continue to add sodium hydroxide solution until the solution changes from yellow to red. This reading times 10 plus the percentage obtained for free hydrochloric acid, represents the total acidity in terms of normal sodium hydrate solution.

Lactic Acid. To determine the presence of lactic acid take 10 c.c. of water in a $5 \times \frac{5}{8}$ in. test tube. One drop of 10 per cent ferric chloride solution is added. Shake thoroughly. To this add 2 or 3 drops of filtrate. The presence of lactic acid is then indicated by a bright canary yellow color.

BILE IN FECES

Bile is detected by mixing feces with saturated solution of bichloride of mercury and allowed to stand over night. A pink color denotes bile. The feces should be examined for red blood cells, white blood cells, ova, and parasites, microscopically.

Examination of feces for blood is done as for the urine.

BLOOD

It is scarcely necessary to describe in detail the methods for counting blood cells. In surgical practice however, there are certain examinations that should be done and in the opinion of the writer are of great importance.

Bleeding Time. The lobe of the ear is pricked and the time is noted; the piercing being done with a sharp needle. The blood is removed as soon as it accumulates, by lightly touching the tip with ordinary blotting paper. The time that the bleeding stops of its own accord is noted. The period of time between the beginning and the cessation of bleeding is known as the bleeding time. The normal bleeding time is one to two minutes.

Coagulation Time. This is best determined by the use of a capillary pipette which can easily be made from ordinary glass tubing about 4 mm. in diameter, the tubing being heated in the Bunsen burner and drawn out while hot. The blood is collected in such a capillary pipette about 6 cm. long from a finger tip puncture, and the time is noted. This pipette is then gently broken at one minute intervals and time of first appearance of the clot is noted. The difference in time between the finger puncture and the first appearance of clot is noted as coagulation time. Normally, by this method, it is up to nine minutes.

Blood Sugar Estimations. Blood sugar estimations can be conveniently done by the micromethod, as described by Kramer and Gittleman. The blood is drawn from the finger tip into a special pipette (marked 0.1 c.c. to 0.2 c.c.) up to the 0.1 c.c. mark and expelled into a $4 \times \frac{1}{2}$ cm. test tube graduated at the 2 c.c. mark and containing 1.5 c.c. of distilled water. The pipette is washed by drawing and expelling the solution several times. One-tenth cubic centimeter each of sodium tungstate solution (10 per cent aqueous) and two-thirds normal sulphuric acid are added. The contents are mixed by rolling the tube between the hands until the mixture changes to dark brown. The volume is then brought to 2 c.c. with water and mixed. It is allowed to stand for five minutes and centrifuged for two to three minutes. To 1.5 c.c. of supernatant fluid add 2 c.c. of copper solution in a sugar tube. Prepare the standard in a similar manner. Put both tubes in boiling water bath for six minutes and then cool. To each tube add 2 c.c. of phosphomolybdic

solution followed by water up to 12.5 c.c. Set standard at 15 and read in colorimeter.

Calculation is $\frac{S}{R} \times 0.1 \times \frac{1000}{7}$ mgm. per c.c.

S = reading of standard. R = reading of unknown.

The reagents, including the standard dextrose solution mentioned, may be purchased prepared for use and are stable. The assembled apparatus for this method is supplied by laboratory supply houses.

Icterus Index. The icterus index is done on the blood serum. About 10 c.c. of blood are collected in a test tube, allowed to clot and the serum is carefully pipetted off. The depth of the color of the serum is compared to a standard consisting of potassium dichromate solution, 1:10,000 in water, in any standard colorimeter. Should the serum be of a much deeper color than the standard, suitable dilution with water must be made. The result is obtained by dividing the reading of the serum by the reading of the standard and multiplied by the dilution, if any is made. The normal varies between 5 and 6.

Rosenthal Test for Liver Function. Blood is drawn off and serum is collected. Through the same needle the necessary quantity of bromsulphalein is injected, according to directions on the box. Fifteen minutes later, and one hour later, specimens of blood are again withdrawn from the vein. The serum is allowed to separate and is pipetted off. To each of the three specimens of serum, 1 drop of 5 per cent sodium hydrate solution is added. A purplish discoloration denotes the presence of dye. Normally, the first tube should contain no dye, the second tube very little if any, and the third, none.

Phenolsulphonephthalein Test for Renal Function. After the patient has emptied the bladder, he is given 8 oz. of water to drink. Using a 1 c.c. Luer syringe, 1 c.c. of phenolsulphonephthalein (supplied ready for use in ampules) is injected into the cubital vein of the arm, or into the gluteal region intramuscularly. Exactly one hour later, the patient voids. He is given two glasses of water to drink at this time. One hour after this, he again voids. Both specimens are alkalinized with 10 per cent sodium hydrate solution and the volume is brought up to 1000 c.c. with tap water. The percentage of dye is estimated in the colorimeter. If the injection is intramuscular, the urine specimens should be collected one hour and fifteen minutes and two hours and fifteen minutes later.

Carbon-dioxide Combining Power of Blood. The estimation of the carbon-dioxide combining power of the blood can be done easily by means of the portable apparatus recently described by Fradkin,[1] full directions accompanying the apparatus.

Sedimentation Time of Blood. The sedimentation time of the blood is estimated by drawing blood from a Luer syringe up to the 1 c.c. marked in a tuberculin syringe which has previously been charged with 0.2 c.c. of 5 per cent sodium citrate solution. The contents are then expelled into the sedimentation tube designed for that purpose. Readings are recorded when the red blood cell column reaches the 16 mm. mark. Normally this occurs within about an hour.

Iso-agglutination and Mutual Match for Transfusion. For the determination of the blood group, it is necessary to be provided with serum from a group A(II) and group B(III) individual. On an ordinary slide place separately a drop each of group A and group B serum. To each drop add 1 of the blood of the individual to be tested and mix. Examine after five minutes under the low power microscope. If the red cells are clumped only with the group A serum, the blood is that of a group B individual. If the cells are clumped by the group B serum, the individual belongs to Group A. If the cells are clumped by neither, the individual belongs to Group O. If the cells are clumped by both, the individual belongs to group AB. In the latter instance, auto-agglutination must be ex-

[1] *Lab. & Clin. Med.*, 14: 973, 1929.

cluded. By observing the individual's blood cells without the addition of serum, if there is no clumping, auto-agglutination can be excluded.

For Cross Matching. Into a white blood cell pipette aspirate 3 per cent sodium citrate solution up to 0.5 mark. Fill the pipette with blood of the recipient up to the 11 mark, mix and expel all but the contents of the capillary portion of the tube up to the 1 mark, into a 3 × 3/8 in. test tube. Expel the remainder into a similar tube. Expel all the contents of pipette excepting that in the capillary pipette up to the 1 mark, into recipient tube containing the smaller portion of the blood. Expel the remainder of the contents of the pipette into the test tube containing the larger portion of the recipient's blood. Shake both tubes thoroughly. Let stand for ten minutes and on a slide observe under the low power microscope. If there are no clumping in either, the bloods are compatible.

OFFICE TREATMENT OF URINARY TRACT IN WOMEN*

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IN THE consideration of the scope of office treatment of bladder, urethral, ureteral, and kidney conditions, one must take into account the magnitude of the procedure, the tolerance of the patient for the treatment itself and the reaction. Also the care she may have after leaving the office. What is well borne by one patient would prove impossible for another. If there is any doubt as to the reaction the patient may experience, the first treatment should be given in the hospital; the reaction to this will serve as a guide to subsequent care.

The patient should be cautioned as to any possible disagreeable after-effects, and instructed as to what to do should they occur. Means of relief, rather than a prescription, should be given, thus avoiding unnecessary suffering while waiting for the medication.

A large part of the office work in urological conditions relates to diagnosis, but this does not fall within the scope of this paper. The subject will be discussed in relation to the kidneys, ureters, bladder, and urethra.

KIDNEYS

Office treatment of the kidneys is restricted to pyelitis, and stricture of the ureter at the ureteropelvic junction. Dilatation of the stricture at this point can be well carried out in the office, if previous dilatation in the hospital has not been attended by too marked a reaction. For the renal infections, lavage may be as well done in the office as in the hospital, provided ureteral drainage is competent and the condition is not acute. Kidney lavage is not apt to be attended by disagreeable reaction. My best results have been with nitrate of silver, though in the instances where there is moderate hydronephrosis, a water-soluble substance, such as mercurochrome, which does not produce a precipitate with the urine, is in order. It is, of course, understood that a thorough diagnosis has been made and that one is dealing with a simple pyelitis, and not a kidney stone or tuberculosis.

URETERS

Conditions most frequently requiring attention are ureteral strictures, calculi,

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and intravesical ballooning of the ureter with narrowed orifices.

Strictures. The first dilatation should preferably be in a hospital, although it may be performed in the patient's home, or even in the office if the patient is within easy reach of home. Often there is quite a reaction, and the patient may develop acute retention in the ureter and the kidney pelvis from ureter blockage due to the swelling of the ureteral mucosa following instrumentation. This is not so apt to occur in subsequent dilatations. Dilatation should be done in a gradual manner, and no attempt should be made to reach the maximum at one treatment. By using dilators of an increasingly larger caliber, at intervals of four to seven days, the dilatation may be carried up to 9, 10, or even 14 F., with little or no reaction and only slight discomfort. Until one sees what reaction is experienced the patient is directed to go to bed, apply heat for pain, and to have codeine, or if necessary, morphine, in doses sufficient to relieve.

Stone. This is usually best treated in the hospital, though occasionally it is justifiable to pass a catheter or bougie as an office measure, to change the position of the stone, to loosen it when adherent, or to dilate the ureter below the stone. While I have fulgurated the mucosa over a stone impacted in the lower end of the ureter, in the office, I feel it is a bit too much except in cases of phlegmatic individuals who tolerate pain well. It is difficult to get anesthesia by any of the methods that can well be considered office procedure. The same applies to the cutting or fulguration of the ureter that balloons intravesically.

BLADDER

The most usual condition encountered here is inflammation. While many feel that bladder inflammation is nearly always associated with renal infection, urethral obstruction, or foreign bodies, I am convinced that most of the bladder infections which come under my observation are primary in the bladder and not complicated with obstruction or kidney infection. For these, lavage with boracic acid solution, followed by the installation of argyrol, combined with urinary antiseptics, gives good results. Rest in bed is important though not absolutely essential. Hot vaginal douches often afford relief. For the first few days a sedative, such as tincture of hyoscyamus with potassium citrate, is given. Of the urinary antiseptics, urotropine and pyridium have been the most effective I have found. Except with an alkaline urine, the acid sodium phosphate should not be given with the urotropine, as it sometimes produces a very marked irritation and an exaggeration of the cystitis. Frequently hematuria, of vesical (or renal) origin, is produced. In some of the more stubborn cases silver nitrate, 1:10,000 to 1:2,000 is more effective than the argyrol.

The Hunner type of ulcer is best treated in the hospital by fulguration under spinal anesthesia, with subsequent office treatments consisting of the installation of argyrol, rivanol 1:5,000, or nitrate of silver 1:500. Some of the more simple ulcers may be sufficiently anesthetized with 5 per cent cocaine, to lightly fulgurate or to touch with silver nitrate stick, with patient in knee-chest posture.

Small foreign bodies may be removed either through the water type of cystoscope or the Kelly endoscope.

Certain papillomata may be fulgurated with little discomfort. There is almost no pain to this procedure until the base and the vesical wall are treated. If the growths are large or numerous, the fulguration is more satisfactorily done in a hospital with the patient anesthetized.

The most frequent, and one of the most troublesome, conditions encountered is cystitis coli, or inflammation localized in the trigonal area, often extending into the urethra. This is best treated by urethral dilatation to 30 or 35 F. and applications of 5 to 10 per cent silver nitrate to the trigonum and urethra,

through a Kelly endoscope with the patient in the knee-chest posture. Previous applications of cocaine to the urethra and bladder makes this only slightly uncomfortable. The reaction is not often of any great moment; though there may be urgency and frequency for an hour or more. This treatment may be given every five to seven days.

URETHRA

Urethritis, stricture, papillomata, caruncles, and skenitis may all be treated in the office.

Urethritis. Acute urethritis is most often due to the gonococcus. In the acute stage of the infection rest, alkalies by mouth, and hot vaginal douches are indicated. After the condition subsides to some extent, argyrol is injected once or twice daily. When it is impracticable for the patients to come to the office for these treatments they have been instructed in the injecting of the argyrol themselves. It is not a difficult procedure for them and I have seen no harm result. The condition has cleared up much more rapidly with the frequent treatments. In chronic urethritis the best results have been obtained by the application of 5 to 10 per cent nitrate of silver through a Kelly endoscope, with the patient in knee-chest position. If there is any evidence of urethral stricture, the urethra should be dilated to 35 to 37 F. Treatments are given every five to seven days. A cystitis coli, or trigonitis, is often present at the same time and should be treated with applications of silver to the trigonal area.

Skenitis is a frequent accompaniment of urethritis and usually clears up as the urethritis improves; but at times the infection becomes chronic in the glands and their ducts. With a suitable speculum (skenoscope) and a small probe-pointed cannula these ducts may be injected with an antiseptic solution. Argyrol works well if the infection is not of too long standing. If a destructive action is desired strong silver nitrate or carbolic acid may be used. Some may require incision and the application of pure silver nitrate, or the galvanocautery. Electrocoagulation may be used but the degree of destruction is difficult to determine and may result in too much tissue being destroyed.

Papillomata. These are not uncommon in the urethra and should be fulgurated through one of the modifications of the Kelly endoscope with the patient in the knee-chest posture. Cocaine anesthesia, brought about by the application of a 5 per cent solution of cocaine, is usually sufficient.

Stricture. While not as frequent as in the male, more cases are encountered than is usually thought. Many are of large caliber, and while not usually sufficient to cause retention of urine, often interfere with the healing of a chronic urethritis. They may be detected with a bougie a boule. Often there is a contracture of the external meatus, especially in older women. Rarely does one meet a tight, fibrous stricture. Except for those at the external meatus, dilatation, done gradually, and at a number of sittings, is sufficient. There is a tendency to recontraction and repeated dilatations at intervals of 2 to 6 months may be necessary. For the contracted, external meatus, incision, under infiltration anesthesia, may be required.

Caruncles. These are best removed by the Oudin or desiccating current. For large ones, where deeper destruction of tissue is required, carefully controlled electrocoagulation may be indicated.

Again I wish to emphasize that while many procedures are possible in the office, only those which can be well tolerated by the patient should be done; also that provision be made for any reaction which may occur as a result of treatment.

SURGICAL CONDITIONS OF THE EYE*

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SURGICAL treatment of conditions of the eye can be employed safely in office practice if precaution against infection is used. Asepticism, as it is employed in modern operating rooms, should also be used in office practice rather than antisepticism; this will permit uninterrupted healing of wounds. Antiseptics in mild solutions do not materially interfere with healing of clean wounds and sometimes the use of strong solutions, topically applied, prevents the spread of infection from wounds that cannot otherwise be made surgically clean, without delaying healing further than the time necessary for the sloughing of necrosed tissue. As a false sense of security may be engendered by faith in the antiseptic properties of solutions usually employed in ophthalmic surgery, they may better be used sparingly, and as adjuncts, rather than as primary agents. A high degree of asepsis can be attained by copious irrigation of the eye with neutral, or slightly alkaline, solutions so that minor injuries and small surgical wounds can be adequately cared for. The skin and conjunctiva naturally harbor organisms, most of which are not pathogenic and do not penetrate the epithelial layers. Such organisms are easily caught in the mucous secretion of an irritated or inflamed eye and are carried away with the secretion. A convenient method of irrigating the eye in office practice is by a solution of boric acid in a common wash bottle which can be sterilized daily and can be kept filled with a freshly prepared and sterilized solution.

The conditions of the eye for which surgical treatment can be used affect the lids, conjunctiva, lacrimal apparatus, and cornea, in the relative frequency of the order in which they are named. In industrial practice, in which eye hazards are increased by exposure to injury by fragments of metal and of wood, affections of the cornea are, of course, more common. But most of such corneal lesions are minor and do not require procedures that would be classified as surgical.

AFFECTIONS OF THE LIDS

Sty and Chalazion. The common sty, an inflammation of one or more of the sebaceous glands of the eyelid, is the most frequent condition of the lid which one is called on to treat. The onset is insidious, with edema, and tenderness of the lid; a sensation of foreign body in the eye is the chief complaint. The appearance of the lid is characteristic. There is a center about which the swelling occurs, usually pointing early in the course of the inflammation to the gland affected. The swelling of the lid is not uniform, differing thereby from the swelling seen in deep-seated conditions of the eye or orbit, or in constitutional disorders. Several glands may be affected at one time, with marked swelling and tenderness of the lid, and even with fever with toxic symptoms. The confluence of several purulent pockets may spread to cellulitis of the lid, with marked infiltration of the deeper structures of the orbit. More often, however, the affection is seen as multiple stys recurring along the margin of the upper and lower lids, first on one eye, then on the other, sometimes continuing for several months in spite of treatment.

Medical treatment of stys will not be considered in this article, but it must be made clear that the sty is an acute inflammation and should be treated as such to prepare the way for operative procedures if such should become necessary.

Not often does the infection extend beyond the lid. Complications are rare.

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Usually the gland breaks down and a purulent cyst will point at the margin of the lid. Spontaneous rupture will be followed by prompt healing, without a visible scar. However, indolent stys occur that do not rupture spontaneously, but remain as cystic swellings. Edema and tenderness may not have been noticeable. After several weeks the tumor may disappear, leaving a small, cord-like, palpable body, or it may remain for months without noticeable change. Such a lesion is usually referred to as a chalazion.

During the acute stage of inflammation a sty should not be opened. It is contrary to good surgical practice to open into a region of acute inflammation. Under normal conditions an abscess with a protective wall will form, which will open spontaneously or which may be opened into or excised. The more acute stys should be allowed to run their course with non-surgical interference. After the subsidence of the inflammation, if a cyst or pocket of pus remains, as a chalazion, it should be removed.

When the swelling of the lid due to acute inflammation has subsided, the chalazion may be felt as a mass in the lid. From the conjunctival side it can be seen as a round, loosely attached body if it is in the lower lid; if in the upper lid, it appears as a discolored streak in the tarsus. A large chalazion may be present beneath the skin of the lid as well as on the conjunctival side. A chalazion should be removed, however, from the conjunctival side. Complete anesthesia can be produced by the hypodermic injection of 15 minims of a 2 per cent solution of procaine. This solution can be had in ampules of convenient size, sterilized and ready for use. The lid should be everted and firmly held in chalazion forceps. The incision should be made along the line followed by the cyst. In the case of deep conjunctival cysts in the culdesac, the incision should be in the direction of the fold, whereas to open a cyst in the tarsal plate of either the upper or lower lid, the incision should run perpendicular to the margin of the lid. The incision should be long enough to permit free inspection of the inside of the cyst. The walls should be curretted, then swabbed with a caustic agent, such as zinc chloride, silver nitrate, or phenol and alcohol. After further copious irrigation with boric acid solution a bandage should be applied with light pressure to prevent bleeding.

Ectropion and Entropion. Ectropion of the lower lid, with hypertrophic conjunctivitis, may often be satisfactorily corrected by cautery puncture, after the method described by Ziegler. Simple excision in hypertrophic conjunctiva is followed by irregular contraction, that shortens the lid between the canthi, and only in exceptional instances should it be done. Surgical procedures for correction of ectropion other than use of the actual cautery, call for more extensive work than should be attempted outside of a well equipped operating room. Entropion of the lid is more frequently brought to the attention because of contracting bands in the culdesac, following chronic conjunctivitis or injury. The normal secretion of the conjunctiva is replaced by a thick mucous discharge which rolls into long strings that sweep about over the eye, causing great annoyance and discomfort. The lashes come in contact with the cornea, producing superficial keratitis which in turn stimulates further congestion and lacrimation.

Bands and Contractures. Bands or adhesions varying from only slight contraction in the culdesac to pseudopterygium and symblepharon are of common occurrence. If they result from chronic trachoma, xerophthalmia, pemphigus, or membranous conjunctivitis, the entire conjunctiva may be so changed that repair can be made only through replacement by skin or mucous membrane from some other part of the body. Simple division of conjunctival bands and adhesions is a common office practice that is mentioned only to be condemned. Stretching of bands, or the insertion of plates of wax

or metal after division, only leads to more firm contraction and increases the severity of the symptoms. Contracting sockets following enucleation are sometimes filled with gauze or a large artificial eye in an attempt to enlarge it. The result is always disappointing and increases the difficulties to be overcome in an operation later. The correction of contracted sockets or contracted culdesacs is a procedure that should not be carried out in the office.

Biopsy. If properly done, there is little harm at any time in taking tissue from the conjunctiva or lid for biopsy. Probably the greatest error in taking tissue for biopsy lies in taking too little. The pathologist must see the entire lesion if he is to give the most valuable diagnosis. Entire chalazions may be excised without deformity of the lid. Recurrent chalazion should arouse the suspicion that a malignant condition is present and it warrants complete excision of the growth for pathologic examination. The same holds true for recurrent growths about the limbus. A well developed epithelioma of the cornea or conjunctiva, at the limbus, may occur within three weeks from the onset of the first symptom. An effective method for removing limbal growths is through use of the electric cautery. However, the histologic pathology of growths in this region should be known; therefore it is advisable to excise them under local anesthesia before applying the cautery. To remove growths at the limbus, a sharp scalpel should be used. Beginning on the corneal side, the entire growth often can be shaved off and preserved for pathologic study. The denuded area should then be lightly cauterized with an actual cautery and the eye should be closed with a quantity of White's ointment placed under the lid. Any growth worth removing from the eye is worth pathologic examination. Epithelioma at the limbus frequently is not diagnosed; yet it is not infrequently seen. Radium and roentgen rays are of value after the growth has been removed surgically.

AFFECTIONS OF THE LACRIMAL APPARATUS

Lacrimation varies with reflex irritation of the eye, and the freedom with which tears can escape through the nasolacrimal duct. Interference with the escape of tears may be brought about by inversion of the lid, so that the puncti rest flatly against the ocular conjunctiva, occluding the canaliculi. With winking of the lids and movement of the globes there is a drawing upward of the secretion from the nasolacrimal duct, through the puncti, because of the valve-like action when the puncti lie flatly against the conjunctiva. Tears will not escape through the canaliculi when the puncti are in this position. Consequently, there is a collection of lacrimal fluid mixed with secretion from the sac, flooding the eye, frequently giving rise to troublesome conjunctivitis. Occasionally, atresia of the puncti also is present. Usually there is less conjunctivitis with atresia of the punctum than is found with a wide punctum that is turned inward against the globe. The difference in irritation can be accounted for by the absence of secretion pumped up from the lacrimal sac. To remedy either condition, it is necessary to establish free drainage for tears through the nasolacrimal duct. After a few drops of cocaine or butyn solution have been instilled, the lacrimal apparatus should be sounded very carefully by a No. 1 or 2 silver Bowman probe. Great care should be taken not to injure the punctum or the lining of the lacrimal sac. If the only obstruction found is in the punctum or canaliculus this may be corrected by simply dilating the punctum a few times, or by slitting the lower canaliculus with an Agnew knife, after the method of Stilling. The necessity for opening the canaliculus is in the minds of most practitioners, very seldom encountered.

The beneficial effect of such operations can be augmented by frequent irrigation of the culdesac and instillation of a mild alkaline lotion, consisting of zinc salicylate, 1 grain to the ounce of saturated solution of

boric acid. A few drops of solution of epinephrine may be added to the collyrium according to the wishes of the surgeon. In more protracted cases, lacrimation and conjunctivitis are the results of occlusion or stenosis of the lower portion of the lacrimal duct. Exploration of the duct with a small sound usually will reveal the situation of the first obstruction below the sac. In infants, it is usually necessary only to push the probe on into the nose to secure adequate drainage. Rapid dilatation of the duct with the use of large probes is successful in some cases, but more often disappointing in its results. The procedure is painful, as it is rather difficult to secure adequate anesthesia by topical applications. If large probes are to be used the procedure should be done under general anesthesia and would better be done in a well equipped operating room. Operations for the relief of dacryostenosis, other than sounding the duct, are hospital procedures. The safety of the eye and comfort of the patient should be the first concern in the treatment of lacrimal stenosis. Many patients who now seek relief for dacryostenosis have had the lacrimal duct probed many times with no benefit. The lining of the nasolacrimal duct is abundant, hanging in folds, and contains many pockets through which a false opening could easily be made if force were used in exploring for obstruction.

A conservative procedure consists in injecting a few minims of procaine into the lacrimal sac, bringing about analgesia without complete anesthesia. A small probe can then be manipulated in the duct without pain unless undue pressure is used. The patient can then indicate to the surgeon whether the probe is going through the sac, whereupon it should be withdrawn. This procedure may be repeated daily for a week or two. If the duct cannot be opened easily a more radical operation should be adopted. Cellulitis of the face often follows the passage of a probe through the wall of the sac; so great caution should be exercised in probing the duct. Only those who are thoroughly familiar with the use of such probes should undertake to dilate a stenosed duct.

GENERAL COMMENT

The practice of office surgery of conditions of the eye should always be conservative. Unless some evident benefit is to be derived from a surgical procedure, one should refrain from attempting operations that cannot be completely carried out under conditions as satisfactory as those which could be obtained in an operating room.

BLEEDING FROM THE VAGINA*

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In this age of modern hospital facilities, it would seem as though most cases of bleeding from the vagina should be sent to institutions for treatment. This is true in most urban communities. Nevertheless a considerable proportion of cases receive some form of treatment before arriving at the hospital and this treatment is instituted either at the home of the patient or in the physician's office.

Anyone who has had even a moderate experience on the gynecological services in hospitals in the larger cities, cannot fail to be impressed by the inadequacy of vaginal packing as performed by the casual practitioner. In most instances the tampon consists of a piece of plain bandage gauze about one yard long which is floating about in the vagina and serving no function except as a possible source of infection.

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In cases of incomplete abortion, hydatidiform mole, uterine fibroids or polyps, fibrosis uteri, malignant disease of the uterus (either fundal or cervical), endometrial hyperplasia, and the hemorrhages associated with the latter months of pregnancy, i.e., placenta previa and premature separation of the normally implanted placenta, the hemorrhage may be so alarming as to cause the practitioner to consider immediate packing of the vagina.

At the Long Island College Hospital, we have been trying, for some time past, to impress our students with the fact that in cases of placenta previa and premature separation of the normally implanted placenta, the diagnosis should be made on the history and abdominal findings alone, and that a vaginal examination is not necessary and most certainly not beneficial; and that vaginal packing is contraindicated. We feel that nothing is to be gained by these procedures, and if they are done, they transform a clean case into a potentially infected one. Thus they interfere with the possibility of delivery by cesarean section, if such a procedure is considered.

It is well to keep in mind Cullen's classification of vaginal bleeding when in attendance on a case of this kind: (1) bleeding associated with pregnancy: abortion, ectopic, gestation, hydatidiform mole, retained secundines, chorio-epithelioma, placenta previa, premature separation of the normally implanted placenta; (2) constitutional causes: endocrine dyscrasias, etc.; (3) bleeding *not* associated with the pregnant state: cervical or fundal polyps, endometrial hyperplasias, cervical block, malignant or non-malignant tumors.

If the bleeding is due to causes other than those of placenta previa or premature separation of the placenta, and is severe enough to warrant immediate packing the technic should be as follows:

The patient should be placed in either the genupectoral (knee chest) or Sim's left latero-prone position. The vagina cannot be properly packed with the patient in the dorsal or supine position.

The operator should then encase his hands in sterile rubber gloves (preceded by surgical preparation of the hands if facilities are present).

A sterile Sim's speculum should then be introduced into the vagina. (The Graves bi-valve speculum is of little value in vaginal packing unless it is opened and transformed into a modified Sim's instrument.)

The cervix and vaginal vault is then painted with Tr. iodine or 4 per cent mercurochrome solution applied by means of sterile cotton pledgets about the size of a walnut, held by a sterile sponge stick holder.

Two-inch sterile vaginal packing gauze in the form of a roll should be used. It should be immersed in either normal saline solution or 4 per cent solution of mercurochrome. The gauze must be moist. One end of the roll is grasped by means of a sterile uterine dressing forceps. The roll is held in one hand and unrolled as it is fed into the vagina through the speculum. The first portion of the moistened gauze is placed against the external os of the cervix, then the vaginal fornices are packed. The packing is continued until the vagina is filled to capacity. The amount of gauze used depends on the size of the vagina, but in general it may be said that unless at least 5 yards have been used the packing is inadequate. Some cases take as much as 10 yards.

Vaginal packing should never be left in situ for more than forty-eight hours. Its removal should be gradual, beginning with a few inches at the end of twenty-four hours until it has all been removed.

VARICOSE VEINS: THEIR CAUSE AND TREATMENT*

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MANKIND has been afflicted with varicose veins since time immemorial. These afflictions have caused considerable discomfort and inconvenience to some while others have suffered only slightly. Various forms of treatment have been resorted to with numerous good and bad results.

Varicose veins and their relation to varicose ulcers were early referred to by Hippocrates, Galen, Paré, Hunter and Valsalva. Several of these noted men made special studies of the ailment. Hunter and Valsalva were among the first proponents of the theory that stagnation of blood in the veins of the legs was the pathogenic cause of varicose ulcers.

ETIOLOGY

Among the most frequent causes conceived for the formation of varicose veins are weakened walls as shown by congential abnormalities or bodily weakness derived through other depleting conditions, infectious emboli associated with a low-grade symptomless phlebitis, endocrine disturbances, stasis due to strenuous sternuous physical occupations, tight garters, etc. Pelvic pressure caused by such factors as pregnancy and tumors is also one of the chief etiological factors. Kashimure, a Japanese surgeon, believes that loss of nervimuscular tone is one of the important causes. It is not inconceivable that several of these factors in the same person may account for the varices found among many of our patients.

PATHOLOGY

The pathology of this aggravating condition has been described by many, of whom McPheeters has given one of the best descriptions. Most of the venous blood of the leg normally flows upward through two sets of veins, the deep and superficial saphenous. The deep veins are supported by muscle and fascia and seldom have varicosities. The superficial veins have little support except their thin walls and the overlying skin. Both have valves supporting their respective columns of blood.

Due to the causes already enumerated the weakened walls of the veins give way. The valves, unable to support the extra column of blood, allow a backflow. Dilatation, distention, sacculation and elongation are the results. They have been classified into four different sizes: (1) up to 0.5 cm.; (2) 0.5 cm. to 1 cm.; (3) 1 cm. to 1.5 cm., and (4) 1.5 cm. to 2 or more cm. Those larger than 2 cm. in diameter are generally saccular and aneurysmal in type.

Much discussion has been carried on regarding the direction of the flow of blood in cases of varicose veins. It has been shown under the fluoroscope that when 1 c.c. of lipiodol was injected near the outlet of the long saphenous vein it was forced by muscular pressure to below the knee, thence through the communicating veins to the deep saphenous vein. Muscular action of the toes and ankle caused a fluctuation in the deep saphenous vein while by pushing the toes against a solid object the blood would flow upward into the iliac veins. None flowed upward through the superficial saphenous vein. This shows therefore that the flow of blood in varicose veins of the leg is practically stationary or reversed, flowing from the superficial to the deep through the communicating veins.

SYMPTOMS

The symptoms of this unpleasant condition, such as early fatigue in walking or standing, cramps in the legs, severe pain where there is a phlebitis or periphlebitis,

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depends upon the degree of incompetency of the veins. If ulcers are present serious hemorrhages may take place.

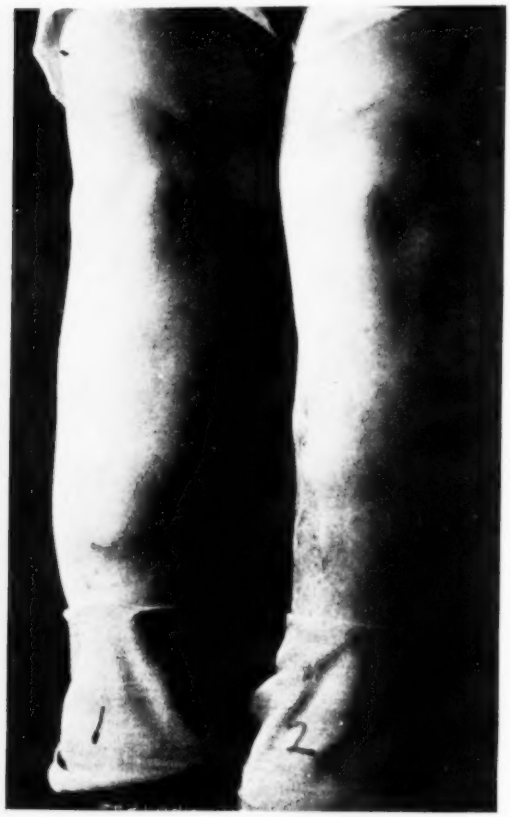

Fig. 1. Legs of patient before injection. Left leg (No. 2) shows dilated vein beginning at edge of ulcer and extending nearly to knee. Leg No. 1 was very similar to left.

DIAGNOSIS

The degree of varicose involvement must be determined by a very careful examination. Not only must the circulation of the extremity be accurately determined but the patient's general condition, especially in relation to his circulation and kidney function, requires a careful study. Cardiac decompensation with hypertension needs careful checking up, also cases with acute or chronic nephritis and diabetes. The main fact to be determined relating to the circulation of the extremity is the patency of the communicating and deep veins. Pratt's method is probably one of the best and most recent tests. He applies an ace bandage around the leg below the saphenous opening sufficiently tight to prevent circulation in the superficial veins. If after walking 10 blocks there is no pain in the leg the deep veins are considered to be functioning normally. Phlebitis and periphlebitis must be ruled out as tested by looking for painful areas on pressure and pain experienced by the patient on walking.

TREATMENT

Having ruled out such complications as have been mentioned one can then proceed with the treatment. The history of the injection treatment dates back to the invention of the hypodermic syringe by Pravaz in 1851. Attempts were made to obliterate the veins by perivenous and intravenous injections. Alcohol, phenol, ergotin and other chemicals were used but were soon discontinued because of the disastrous results from infections, hemorrhages and emboli. Linser and Zirn (1916) noticed the hardening results to veins from the intravenous use of bichloride of mercury in treating lues. Frequent cases of mercurial poisoning resulted but stimulated research for a non-toxic solution that would cause a permanent thrombus. To this end they found that 20 per cent sodium chloride was a good substitute for mercury in obliterating veins. Sicard and Forestier noticed during the war that alkaline solutions produced hardening of the veins. They used sodium carbonate but this was too caustic and they were obliged to discontinue its use. Later they used sodium salicylate with much more satisfaction, but found that in an occasional case it caused severe toxic symptoms. Noble of Germany is a strong advocate of invert sugar solution while in England quinine and urethane preparations are popular. McPheeters has used sodium salicylate, sodium chloride and sugar solutions with excellent results. Sodium salicylate is an excellent drug but an injection of a small amount, 1 to 2 c.c., is necessary to test out the liability of its specific toxicity to the patient.

Considerable discussion has been in

vogue of late as to the advantages of the injection treatment over the surgical removal of the defective veins. It would seem, according to the recent literature, that the injection treatment, causing a definite injury to the venous walls, a permanent thrombosis and final obliteration of the veins, is the method of choice. Statistics show that the risk from surgical removal is 1 in 250 while with the injection treatment it is 1 in 5000. The objections to operative risk are:

1. The more frequent occurrence of fatal emboli.

2. Recurrence of varices in the communicating veins sometimes extending across the area of removal to the communicating vein on the opposite side.

3. Unsightly scars.

4. Confinement of the patient from three to six weeks, a very important economical factor.

5. The danger from postoperative infections.

The chief objection to the injection treatment is the theoretical formation of an embolism secondary to the formation of a thrombus. Statistics show that this is more theoretical than real, only 4 authoritative cases thus far having been reported in the literature. McPheeters reports a case of a patient suddenly dropping dead ten days after an injection treatment. Autopsy showed a recent thrombus in the orifice of the pulmonary artery. Examination of the injected veins showed well-formed thrombi.

Fig. 2.

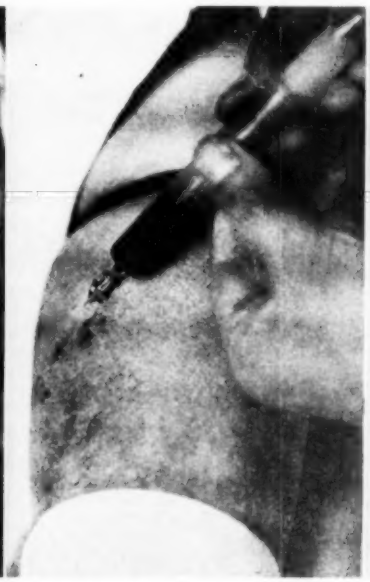

Fig. 3.

Fig. 4.

Fig. 2. Part of right leg with eczematous area under which was large dilated saccular type of varicose vein.
Fig. 3. Needle inserted in vein with syringe containing injecting solution.
Fig. 4. Empty syringe after injection. Above point of injection is a rubber tourniquet tied lightly around leg. This is immediately released following injection.

REPORT OF CASES

I wish to report results of the injection treatment on 20 cases. Five cases had an involvement of both legs. Three cases were males, the remaining women. Two women were under thirty-five, the remaining patients between forty and sixty years of age. Trendelenburg tests were made before injections were begun. One complication resulted. Some of the solution (sodium salicylate in this case) leaked out through the puncture opening of the thin veined walls in a man aged sixty. A small slough resulted, taking two months to heal, but the results to the vein were excellent. All the other patients were

cured of their varicose veins with no recurrences. Several had swollen and tender legs for about two weeks after treatment due to the chemical phlebitis produced by the injections. According to the many workers this counts for a favorable result. The solutions used were sodium chloride 20 per cent for 8 patients and sodium salicylate 40 per cent for 12 patients. A Luer syringe with 26 gauge needle was used. The amount injected was a variable factor, depending upon the size of the vein. The injections of sodium chloride varies from 3 to 8 c.c. per vein while those made with sodium salicylate ran from 2 to 5 c.c. One leg at a time was usually injected, with a tourniquet above the beginning of the varicosity. All patients were treated in sitting posture. All patients complained of a stinging pain lasting five to ten minutes in the leg at and below the point of injection. The sodium salicylate produced a more severe pain than the sodium chloride. All patients were allowed to be upon their feet daily.

COURSE

Immediately after injection the vein becomes hardened and the tortuosity changes into a straighter line. After a few hours the skin over the injected area takes on a bluish or copper color which lasts for several days. Patients should be warned against bumping their legs during the time the organization is going on. It tends to cause injury to the thrombosed vein wall, pain in the injured leg and prolongs recovery. Swelling of the leg is apt to occur, due to the phlebitis of the communicating as well as the injected veins and lasts two to three weeks. Occasionally some of the injected solution will leak out of the thin punctured venous wall, resulting in a slight infiltration of the surrounding tissues, or the solution may be injected outside of the vein. Both of these procedures cause a slough painful and slow in healing. They are best treated by further infiltration of the area with normal saline solution, reducing the concentration of the previously injected solution. Two months are often required for sloughs to heal.

Several investigators, both American and European, have reported upon the histological changes in veins. All agree that the chemicals injected injure the intima, allowing an infiltration into the venous wall. Fibrous tissue develops from the proliferating connective tissue of the venous walls, red and white blood cells are deposited and a firm thrombus results. Organization takes place during the next few weeks and a fibrous cord is the result, thus giving relief from symptoms and a better looking leg to the patient.

SUMMARY AND CONCLUSION

1. A careful physical examination is necessary before any treatment is commenced for varicose veins.

2. Patency of the deep veins must be definitely established.

3. Phlebitis and cardiac defects, nephritis and diabetes are contraindications to either surgical or injection treatment of varicose veins.

4. Any treatment must aim to obliterate the superficial vein and utilize the deep vein for the functioning one.

5. Surgical operations have been less successful than the injection treatment. They often result in recurrences, sloughing, infections and bad looking scars, and prevent the patient from working from three to six weeks.

6. The injection treatment for varicose veins seldom interferes with the occupation of the patient and gives the best permanent result.

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INFECTION OF HAND & FINGERS*

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CONSIDERING the fact that the hand comes in contact with contaminated objects more than any other part of the body, and that the fingers are exposed to more injuries than any other organ, it is remarkable that infections of the hand and fingers are not more common than they really are. They belong, nevertheless, to the most frequent pathological conditions the general practitioner is called upon to treat.

PATHOLOGY

Infections of hand and fingers are due to the entrance of microorganisms through wounds, among which the punctured wounds play the most important rôle. And here again it is the volar surface of the hand and fingers which is more apt to be infected and where infection is of greater danger, owing to the predisposing histological structure of the skin of this surface. When a sharp instrument or sharp body makes a puncture on the soft part of the skin of the dorsum an ensuing infection will meet a pliable skin yielding readily to the formation of an abscess. But when the inner surface of the fingers or hand is punctured and infected, the skin, being of a tougher character and the underlying fat of coarser structure, does not yield and hence the infection penetrates into the deep tissues. This endangers the vitality of the deeper structures and leads to all kinds of complications. It is important, therefore, that punctured wounds and small cuts of the volar surface always be regarded with suspicion, and treated with a presumption that they are apt to be infected more than those of other parts of the hand. Another peculiarity of infections of hand and fingers, again referable to an anatomical peculiarity, is that the wound infections of the dorsal surface are apt to lead to rapid propagation through the lymph channels in the form of lymphangitis, while the infections of the volar surface are more apt to be localized and restricted to the phalanges as so-called felons, or to the palm as abscesses within

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the tendon sheaths, intercommunicating with joints or other structures. The infecting micrrooganisms are either streptococci, staphylococci or other pus-forming microorganisms which enter the tissues of the fingers or hand through punctured wounds with or without a foreign body, such as a small sliver, splinter, a piece of cloth, or other material.

SYMPTOMS

The symptoms of infection may be clear and manifest or they may be very obscure and misleading. As a rule the focal symptoms predominate and lead the physician to an early diagnosis. The local signs of inflammation: heat, swelling, tenderness, redness, as well as a throbbing of the part, will make an early diagnosis of acute infection very probable. The general symptoms are those common to all other infections, namely chills, fever, general malaise, headaches, rapid pulse, etc. However if the infection has lasted for some time these acute symptoms may subside or may become very insignificant. The acute infection usually turns into a subacute one and may lead to a chronic infection, which is characterized by a different symptomnology, namely: the formation of exudate and localized death of tissues or necrosis. The exudate is as a rule purulent. The tissue underneath the tough skin is melting away into a debris consisting of pus and blood, and structures like tendon and bone which have only a meager circulation easily die off, becoming entirely deprived of nutrition because of the thrombosis of the blood vessels and the pressure of the exudate. These abscesses follow predisposing channels along the sides of the tendon sheathes and in many instances lead to their necrosis. This is a very important complication as it has its effect upon the function and the use of the hand. Once established, such an abscess of the tendon sheath is apt to push forward into the palm of the hand, destroying the tendon and perforating into the loose tissue of the dorsal surface, thus circulating the pus into important structures of the hand and leading to destruction of various kinds with contracture or stiffness as common sequelae.

The symptoms of abscess are in many instances characteristic. Fluctuation shows the presence of liquid exudates. Edema is strongly indicative of deep suppuration. Besides the tendon, the bones are very often exposed to the effect of pus. The periosteum is one of the structures which are easily infected through propagation of the process, and a subperiosteal abscess lifts the periosteum from the bone, depriving the bone of its nutrition. This results in an osteitis and osteomyelitis followed by partial or total necrosis of the bone (sequestrum formation).

One of the most dangerous complications is that of infection reaching the capsule of the phalangeal joints and the joints themselves. While we are capable of dealing favorably with the other complications, this one inevitably destroys the function of the joints by leading to a necrosis of the cartilage, which is very poorly nourished by the surrounding blood supply. Fortunately the capsules of the larger joints are very resistant to the acute infection, and as a rule only the small joints suffer in this manner.

DIAGNOSIS

The diagnosis is made from the symptoms already mentioned. The *x*-ray is a very valuable asset in clinching the diagnosis of infections. While inflamed structures do not show any special shadows, the inflammations change the structures of the bone to such an extent that the trained eye of the roentgenologist easily detects the presence of osteomyelitis, osteitis and periostitis. The shadows and the structure of normal bone disappear and the irregular, transparent shadows of the diseased bone take their place. The sequestrum becomes visible. One of the most characteristic symptoms of this infection is the appearance of pus, which by breaking down the tissues forms a

fistula from which it escapes. As soon as this stage is reached, either spontaneously or through the interference of the doctor cutting into the abscess, the general symptoms usually disappear and the acute infection turns into the subacute, chronic stage.

COURSE AND RESULTS

There are hundreds of possibilities following infections of the hand, many depending upon their management and treatment. General sepsis and fatalities are rare. Spontaneously and unaided by the physician many infections yield excellent results, even if treated only by home remedies such as poultices. The infection leads to an abscess, which ripens and breaks through, emptying the pus, and then heals up without leaving a trace behind except a tiny scar. There are other instances in which treatment begins too late. Complications will have arisen, but prompt action can still save the appearance and function of the fingers or hand. There are others which are faultily treated and become so extensive that when they come under the care of the reliable physician irreparable destruction has taken place and function and shape may suffer greatly. Contractures or stiffness of the joints may result from these infections so that the grasp, the hand's most important function, is impossible. Besides the acute, subacute and chronic septic infections there are other infections by different microbes, as the syphilitic and tubercular, which have a protracted chronic course. They require special consideration.

Among the local infections of the fingers and hand are some of trivial nature, starting from hangnails and small injuries on the side of the nails, the so-called run-arounds or paronychia, which lead to very superficial abscesses and are easily dealt with.

TREATMENT

The treatment of the infection in the hands of the expert surgeon is standardized and agreed upon. But the treatment by the general practitioner in his office needs some discussion. First of all, every infection of the fingers should be looked upon as a serious matter, because of its possibilities and complications. The consideration that the infection may disappear without any interference and heal spontaneously should never be accepted too lightly. Most of the septic infections lead to abscess formation. It is, therefore, the object of the physician to watch this abscess formation to stem its tide, and localize it if possible. This can often be done by using the passive hyperemia method of Bier on the infected finger. This consists of shutting off the circulation of the finger by the circular constriction of a rubber band used as a tourniquet. I do not believe that many formations of abscess have been prevented, but fortunately we have seen cases threatened with rapid propagation, which were limited to one or two phalanges, or to a felon, by such a rubber band. Heat and moist dressings are the most advantageous remedies, also hot baths and alcohol applications. Heat brings more blood to the infected area and accelerates the formation of abscess. Whether we apply a hot bath, poultice or electric pad is immaterial. Moist dressing with acetate of lead in the form of so-called Billroth solution, boric acid applications, or the thermic lamps are very beneficial. The crucial part of the treatment is the question whether surgical interference is necessary or not, and herein most of the mistakes are made. Sometimes very aggressive activity in the first place is harmful. It is best to decide first when to incise, second, where to incise, and third, how much to incise. As to the first question, when to incise: Many make the mistake of incising too early and therefore unsuccessfully, because the pus formation has not yet reached the stage of a melting process. Fluctuation, the characteristic sign of abscess in a finger, is difficult to diagnose. The second question, where to incise: There are certain rules about this.

It is best to incise in the direction of the blood vessels, not too close to the tendons or joints, yet into the abscess. The last question, how much to incise: Here the practitioner sins most. If he is of an aggressive nature he is liable to incise too much, but many practitioners are too timid and their incisions reach only the superficial surface, not the abscess, and therefore are useless. The incision, however, is not the only thing the practitioner has to think of. He has to establish a successful drainage, and that is best established in many instances by connecting two incisions through an underground channel which is kept open by silk thread, catgut, or tube or gauze.

An important consideration is the after-treatment of such incisions. Moist warm dressings should be continued, irrigations and local baths, with or without additional antiseptics. These depend upon individual taste more than upon absolute indication and have changed from time to time according to the vogue and, perhaps, mostly because of the advertising by commercial interests.

This treatment of incision of abscess can be done in rare instances with a local anesthetic, but in most cases the patient because of sleeplessness and pain for days is in an excitable condition and is better off when put to sleep for a few minutes. Local anesthesia by freezing is only applicable for very small incisions. Hypodermic injections are very painful so that a few sniffs of gas are most convenient. The after-treatment of a case of chronic suppuration becomes an office routine, as it is often of long duration or the result of a radical and extensive operation in the hospital and the patient does not require hospital care. The after-treatment of cases of chronic infection, after they have healed, in order to improve the function should not be neglected. The office treatment does not terminate when the suppurative process has stopped, but should be continued in the form of massage, electric pads, local baths, and active and passive motion until the function of the hand is restored to the best efficiency possible. Many fingers and hands have been surgically cured, but have remained stiff and useless because of neglect of the all-important after-treatment.

PRACTICAL POINTS IN THE MANAGEMENT OF GONORRHEA IN WOMEN*

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GONORRHEA is so common that it should interest every one of us. Just how common no one knows, but amazing statistics might be quoted. We have all seen figures which show that 80 per cent of our population have at some time or other been infected, and that 90 per cent of these have not been cured. It is the commonest cause of sterility, yet it must cause sterility comparatively infrequently, else, with so many not cured, we should not have to discuss birth control at all. Perhaps the figures are extravagant, but in all probability they are not. Even hasty consideration of its possibilities should convince us of that. One of the most destructive diseases, it is responsible for more sickness and disability than tuberculosis or any other disease we encounter.

Every day, in its chronic forms at least, it is seen by every physician. To the gynecologist it is omnipresent. So common, that he sees it everywhere and has but to

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guard against its too ready recognition, or diagnosis by suspicion.

The general practitioner must meet the same situation, for on him depends the initial treatment and the all-important duty of informing the patient of the sequelae due to neglect; he must tell her that the cure is necessarily slow, but not at all impossible, and that vanishing symptoms do not always mean disappearance of the lesions.

Its practical diagnosis must not rest upon positive smears. They are too hard to get. All too often they are negative, even in the acute stage. If the smear is positive, so much the easier, but it is well to remember that negative spreads are almost the rule, and that positive results are obtained only after repeated trials or provocative treatment, and often not even then. Any conception of the disease which does not take this into consideration makes recognition hopeless and treatment futile.

With this in mind, how can we recognize it? How is the practical diagnosis made? Certainly not by the smears, but by careful appraisal of the history, and systematic pelvic examination. I am speaking in general terms of course, but what I have to say applies to the vast majority of cases.

First, the history. If the patient says that she never had a discharge until marriage, that is probably gonorrhea. If it has been very profuse from the start, it is certainly so. If the discharge followed parturition, it may be due to laceration and infection of the cervix but the underlying etiological factor is often gonorrhea anyway. Treatment of the cervix will be signally unsatisfactory if this is overlooked.

The importance of urinary symptoms such as burning, urgency, frequency and tenesmus cannot be overestimated. Careful questioning may be necessary to bring out the fact that at some time since marriage or coitus, these symptoms were present, even for a short time.

The menstrual history is valuable, and almost any change that followed marriage is significant. Marriage means pregnancy or infection, often both. Sometimes we see a gradually lengthening period, from three or four to six or seven days or more, an increasing menorrhagia. Sometimes the menstrual interval is shortened, and menses recur every three weeks, or twice a month, or some other variation of the cycle. Less often periods are delayed, usually with a lessened menstrual amount, gradually approaching amenorrhea. Almost anything is possible depending upon the site and extent of the pelvic lesion. The important consideration is the association of the menstrual disturbance with marriage.

Pain is not a constant factor, but is usually premenstrual and comenstrual, relieved by the flow itself. With dyspareunia and painful defection, however, pain occurs so often in other conditions that it is corroborative only, and helpful, but not of great diagnostic importance.

Pelvic examination should be preceded in all cases by careful inspection of the vulva, under good light. A head mirror is valuable. In acute cases the intense inflammation of the vulva and the profuse discharge is so characteristic and significant, that diagnosis has to be made but from the acute recurrences which we see so often. There is nothing else like it.

It is with the subacute or chronic case then, that we are most concerned. Look first at the urinary meatus; it rarely escapes. The mucosal redness, edema and pouting of the acute stage have disappeared, but unmistakable evidence always remains. The orifices of the urethral glands are large and red, and the mucosa has lost its uniformly pale color. The urethra is large, thick and sensitive to the finger which strips it carefully in the search for pus, which is of great importance in the diagnosis. As a rule pus can not be expressed until the index finger, following the course of the urethra around the symphysis, presses upon Skene's glands. Thick creamy pus can be nothing else but gonorrhea. Discharge not frankly purulent, thin, small in amount, and apparently from the urethal glands is highly suspicious,

and more often than not, evidence of gonorrhea too. In children it is particularly important to consider all vulvovaginitis as gonorrheal in origin.

Look at the orifices of Bartholin's glands too. They may be seen as two small red points near the last caruncle; the macula gonorrhoica is diagnostic. The glands themselves may be palpated in the lower part of the labia majora; when they are felt, they are important aides to diagnosis.

The cervix is often atypical and our impression of it may depend upon the stigmata of gonorrhea which we have already seen in the vulva. Endocervicitis in the nullipara is almost always Neisserian in origin. A red cervix with yellow pinhead spots irregularly distributed about a cervical os which is pouring pus or plugged with thick glairy mucus is very characteristic.

Salpingitis is usually salpingo-sophorometritis. It is difficult to conceive of an isolated inflammation of the tubes, and proper appreciation of the point will give us a better idea of the pathology within the abdomen. Palpation of adnexal masses is, of course, not essential in the diagnosis, for flaming tubes with open ends may not be felt at all. The diagnosis is made upon the history, signs in the external genitalia, menstrual disturbance, and often the physical signs of the associated acute or chronic peritonitis.

Treatment should be faithful, painstaking, continuous, and carried out with great attention to detail. It is not in any sense difficult, nor is special training required. Acute cases rarely need local treatment. The speculum and douche are harmful. Copious bland irrigations of the vulva, posture drainage, gentle laxatives and urinary antiseptics are all that the patient needs. Time will bring with it more or less immunity, and general localization of the infection will take place. In its subacute and chronic stages it must be sought out and attacked in the places where we expect to find it. Intra-abdominal complications can best be avoided by expectant treatment, but it is well to remember that they often occur two or three months after the vaginal infection, whether local treatment has been carried out or not.

Coitus should of course be prohibited. That goes without saying. It is particularly important, however, to observe this rule when dealing with the chronic cases, where the diagnosis, perhaps tentative at first, has been established to our own satisfaction.

The arrangement of the urethral and cervical glands is such that we cannot expect very encouraging results from antiseptics applied to the surface epithelium of the urethral and cervical canals. Fortunately, however, the urethritis is soon confined to a point just within the meatus. With hairpin retractors, the gland orifices are seen, and injected with 5 or 10 per cent nitrate of silver through a blunt short hypodermic needle. Under local anesthesia, the glands may be slit with a cataract knife, or still better, destroyed by a fine tip actual cautery carefully inserted into the lumen while cold, and then heated cherry red. This may have to be repeatedly done, and often preceded by a dilating cold sound which will relieve the not infrequent stricture, and cause an acute urethritis which rapidly subsides. Injections of organic silver preparations are soothing but not consistently bactericidal. Other aqueous solutions are disappointing, but their efficiency is increased by the addition of small amounts of boroglycerine. Injections of the same into Bartholin's glands with a blunt needle are occasionally successful, but generalized infection necessitates resection of the entire gland.

Vulvovaginitis in adults is not a serious problem, as mature squamous epithelium is very resistant to the gonococcus. In children, this condition is best treated by the method of Norris, who depends upon cleanliness of all the parts, careful drying, and general development of the immature epithelium by the use of weak

solutions of nitrate of silver. Treatment is carried out in Sim's or knee-chest position.

Acute endocervicitis should never be treated. It invariably lapses into the chronic form, and, though difficult to treat then, pelvic complications are not so likely to follow. There is no specific treatment. Organic silver salts are useless. Nitrate of silver in 5 to 20 per cent solution is probably our best agent, but it should be cautiously applied to the cervical canal. Large quantities of kaolin applied to the vaginal vault and held in place by a tight dry tampon will be found helpful. Gellhorn's injections of methylene blue 1 per cent, sterile normal saline are very valuable. Though a short hypodermic needle, 1 c.c. is injected into the cervical tissue at three or four points 0.5 cm. from the cervical canal and parallel to it. Packing the cervical canal and vaginal vault with narrow strip gauze, saturated with 5 to 10 per cent mercurochrome in 50 per cent alcohol will often give good results. Puncture of cysts and striping the cervix with the nasal tip cautery is the latest cure to find favor. It should be cautiously done and not too often. A volume could be written on the treatment of this most intractable lesion, but enough has been said to indicate that intelligent persistent treatment carried out for a long period of time is essential.

Extirpation of adnexal lesions in young women is indefensible. The organism disappears here, long before it can be eradicated elsewhere. Pitiful end results are common. When we come to realize that pelvic exacerbations are nothing more than re-infections, we will more than ever concentrate our attention upon stamping out the disease in the external genitalia and the cervix.

WEBBED FINGERS*

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Webbed fingers is a condition in which two or more digits are united by their lateral aspects. They are as a rule congenital but may be acquired, as subsequent to a burn or other injury which destroys the epithelium of the contiguous surfaces of two digits. Contrary to the experience of some authors, the thin web or *main palmé* has occurred in the authors' experience with equal frequency to the fused fingers or real syndactylism. The following method of corrective treatment has been found most adaptable to webbed fingers, that is with regard to the thickness and narrowness of the web.

The procedure is as follows:

The local area is prepared as for surgery and asepsis is employed throughout. Local anesthesia with 0.5 to 1 per cent procaine, except in infants when an anesthetic is unnecessary, is obtained. A clamp, sufficiently crushing to kill the clamped tissues, is then put on the center of the web. Any type of clamp, varying from the Shoemaker intestinal anastomatic clamp to the ordinary Halsted "mosquito," serves the purpose most satisfactorily. The clamp is held in place by proper bandaging and the fingers immobilized in splints for a period of eight to fourteen days. The crushed tissue becomes a non-vital, dry membrane by four days. It is, however, unwise to move the clamp too soon or to cut the crushed tissue, for the healing is insufficient to hold the skin edges intact until approximately ten days have elapsed. Certainly this is true in the narrow web

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FIG. 1. Webbed fingers of boy, aged ten.

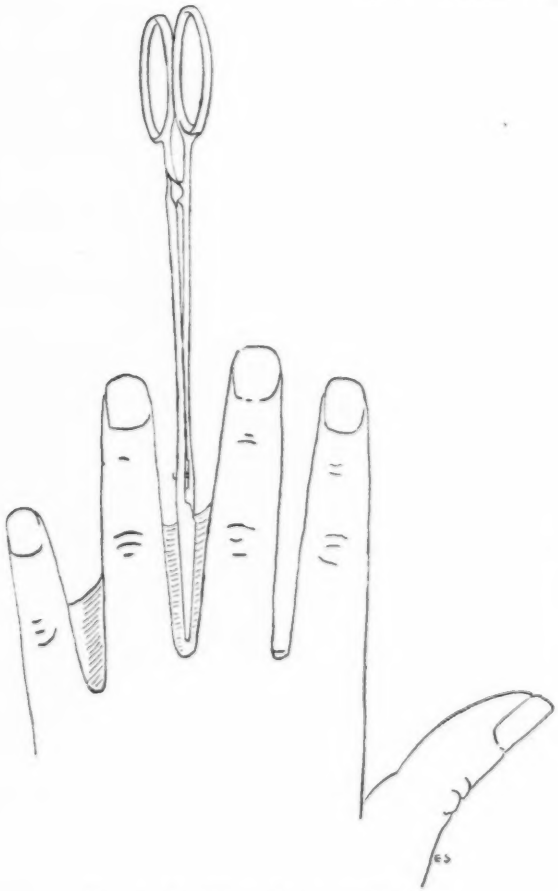

FIG. 2. Crushing clamp applied.

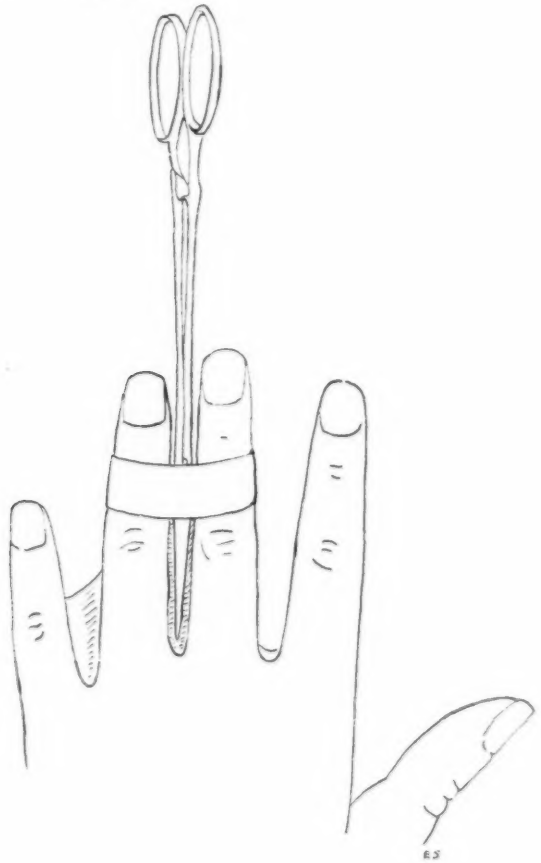

FIG. 3. Crushing clamp held in place ready for bandage and splints.

of 3 to 4 mm. thickness and, therefore, in this type immobilization for a total of fourteen days is advised.

This pressure necrosis method is possible since the digital arteries, veins and nerves lie close to the phalanges.

Following the usual teaching, the correction of a web on one side of a finger is completed before the web on the opposite side attacked. The method would seem equally as applicable to webbed toes although, as yet, it has not been attempted. The method has been used up to the age of ten years, but it is best employed in infancy.

The results have been most satisfactory both from a cosmetic as well as a functional standpoint.

CERVICAL LACERATIONS AND INFECTIONS*

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BEFORE taking up the office treatment of these conditions, let us have a clear idea of the pathological processes to which the cervix is prone and try to evaluate the measures necessary for their correction. The most important are congestion, infection, laceration and malignant change.

It is of the first three that we are concerned as far as the possibility of office treatment having any helpful effect. Many a case of simple chronic passive congestion has been called chronic endocervicitis. The dictum that every lacerated cervix is infected does not stand the test of careful clinical investigation. True, a great many are, and in many cases it is at times extremely difficult to differentiate between infection and congestion and as congestion renders any structure more susceptible to infection, the picture is more complicated.

A careful history and thorough physical examination will often reveal that although there is leucorrheal discharge and the cervix is lacerated, enlarged, everted and eroded, the cervix is more sinned against than sinning, the condition in the cervix being the effect of other lesions as well as of the lacerations. The commonest condition is subinvolution. For many years we have used the term subinvolution of the uterus, whereas in reality the condition is one of subinvolution of the entire pelvic contents, and the underlying lesion a subinvolution of the uterine supports. If one will carefully determine in such a case the excursion of the uterus, one is often surprised to find that he can push the uterus up into the plane of the brim or down into the introitus; that he may hold it tight against the pubis or push it back into the hollow of the sacrum.

The question naturally arises, where is this uterus when the woman is on her feet? The old examination of a woman in a standing position had much merit and often would reveal conditions unthought of if the examination was carried out in the usual manner. Before such a woman in the child-bearing period is subjected to any operative procedure on the cervix, even though there may be some degree of laceration, she should be treated with the idea of stimulating involution of the uterine supports and of the uterus as a whole.

Again, careful examination will reveal the fact that many of these women are of the ptotic type with poor general muscular tone, faulty posture, flat feet, varicose veins, etc.

Before such a woman's cervix is con-

* From The Department of Obstetrics and Gynecology, Long Island College Hospital. Submitted for publication December 18, 1929.

demned to surgery, much can be accomplished to improve her general condition and to stimulate involution. Tonics, proper food, proper rest, attention to the bowels and bladder, tampons, douches, knee-chest posture, and that most valuable instrument, the pessary, will all have a definite place. If there be much erosion, painting with 20 per cent silver nitrate or brushing with the electric cautery will invariably cause complete healing, and if there be extension laceration with considerable eversion, a very deep linear cauterization with a thin blade will often give astonishing results. All of this, of course, takes time and the condition should be carefully explained to the patient lest she become impatient and fail to cooperate.

FIG. 1. Section through portio of cervix.

A, Squamous epithelium of cervix.

B, Healing follicular erosion being lined by columnar epithelium.

C, Hypertrophy and hyperplasia of cervical glands.

D, Druse exudate in stroma and about the glands, consisting of small lymphocytes and plasma cells.

CHRONIC ENDOCERVICITIS

As said before, at times it may be exceedingly difficult to differentiate between the cervix which is simply congested and the one which is infected. Where there is infection, examination will often reveal a slight amount of tenderness in the pelvis, generally in the parametrium and uteral sacral ligaments caused by a pelvic lymphangitis analogous to the lymphangitis which accompanies infection elsewhere. The cervix may be enlarged, eroded and infected and bathed with a mucopurulent discharge. In long-standing cases, the cervix is cystic and hard with hyperplasia.

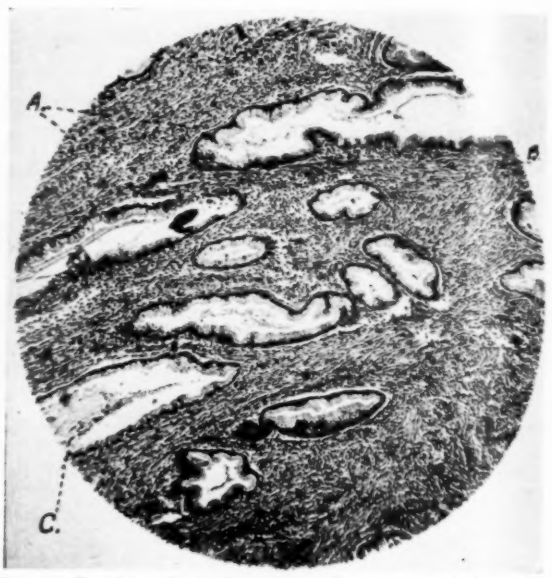

FIG. 2. Section through center of same excised cervical cone.

A, No exudate about glands or in fibromuscular coat of cervix.

B, Absence of hyperplasia and hypertrophy of muscle cells.

C, Gland spaces are normal.

Histologic examination of the cervices which have been removed will show the marked, round-cell infiltration characteristic of subacute inflammation and also show in the majority of cases that the infection only extends from 1 to 2 cm. up the cervical canal. (Figs. 1 and 2.)

Novak pointed out in a recent paper that in the first stage of endocervicitis there is a hypersecretion of the cylindrical epithelium and an extension outward on the pars vaginalis with production of an erosion. In this stage, the erosion is covered with cylindrical epithelium. The latter

still retains its gland-forming tendency so that many gland invaginations may be formed far out on the pars vaginalis. As the inflammation recedes, the squamous epithelium asserts itself again, pushing back the cylindrical epithelium to the region of the external os.

The treatment is obviously the destruction or removal of this infected cylindrical epithelium. This can be accomplished by three methods: operation, caustics or the cautery. The disadvantage of the operation is well known. All surgeons can recall patients who are sterile, who have had abortions or who have had cervical dystocia following operation in the child-bearing period. With this in mind, we believe that other methods should be faithfully tried before operation is advised.

That these cases can be cured by means of the cautery is born out by numerous articles in the literature reporting large series of cases by many observers. It is not our purpose to discuss any series of cases, but rather to describe the method.

We have found that the best results are obtained by using the nasal cautery loop and blade. The transformer should be a noiseless one which can be obtained from any instrument house. The handle should have a finger switch which gives perfect control of the current. Only enough current should be used to give a bright, cherry-red glow to the blade or loop.

The most important factor in the procedure is the management of the patient. She should be told just exactly what one expects to do, that she will experience a fleeting sense of heat and that as soon as she feels it, she is to say so and the current will be turned off. She should be told that this treatment cannot be carried out in one sitting, but that several will be necessary. The necessity for patience and cooperation must be explained.

The cervix is then exposed, any discharge removed and the cold blade laid on the area in the periphery of the erosion one wishes to cauterize first. The current is then turned on and as soon as the patient feels it the current is turned off. She is then asked, "How much did that really hurt?" and she will generally reply, "Why, not much." "Could you stand another application like that now, or would you rather wait until the next treatment?" Most women will stand from three to six applications the first visit. Others who are high strung and nervous had better be given only one so that their confidence can be obtained. The patient is told that she will have an increased discharge for a few days and that there may be a little bleeding which is unimportant; that she should take a daily alkaline douche and return in one week.

At the next visit it will be found that there is a slough at the site of the cauterization. This may be wiped off and the raw surface touched with an applicator dipped in 10 per cent silver nitrate solution. At this time, several other areas may be cauterized, depending on the tolerance of the patient. After two or three treatments, it will be found that all exposed cervical mucosa and erosion have been destroyed and that squamous epithelium of the portio is covering the area. When this has been done, the lower part of the canal may be cauterized. This should be done with the greatest care for if the cauterization is too deep, distressing stenosis or atresia may occur. Generally four applications at one sitting will be all that is necessary. Douches are continued and the patient returns once a week for cleansing of the slough and stimulation of the squamous epithelium with weak silver nitrate solution. In from two to three weeks following the last cauterization, the cervix will be healed. The time varies, however, a great deal depending on the severity of the lesion and the ability of the patient to tolerate the treatment.

If cysts are present near the surface, they may be punctured with the cautery loop. When there is much eversion, a few deeper linear cauterizations may be made, care being taken not to invade the canal lest one cause stenosis or atresia.

LACERATIONS OF THE CERVIX

We are perhaps too prone to think of lacerations of the cervix as just lacerations, forgetting that the trouble does not lie in the laceration *per se*, but in the changes which may take place because of the laceration. Many a woman has a lacerated cervix, at times quite extensive, who complains of no symptoms and it is only when some subinvolution or infection superimposes that she complains. That a laceration tends to cause sterility is not true. It is only when there is subinvolution with marked passive congestion and increased hypersecretion or infection with again hypersecretion, the latter of the mucopurulent discharge, that spermatozoa cannot pass. Measures to remove congestion and to stimulate involution with cauterization of the infected mucosa in infected cases will be all that is necessary.

The only lacerations which require operation in the child-bearing period are the very extensive ones and here trachelorraphy should be the operation of choice. When the lips of the lacerated cervix are everted with exposure of the cylindrical epithelium, removal of this exposed epithelium and its replacement by squamous epithelium leaves simply a misshapen portia with a shortened canal lined by healthy cylindrical epithelium. Such a cervix does not predispose to sterility nor will it cause dystocia as there is no scar tissue in the body of the cervix.

Emmett, many years ago, pointed out the danger of scar tissue and so was careful to remove it, and did his careful trachelorraphy hoping for and obtaining primary union without scar tissue formation.

While this paper was being prepared, I saw a young gynecologist do a trachelo-plasty on a perfectly good inoffensive cervix with a very mild degree of infection with moderate erosion; one in which a very short period of cautery treatment properly carried out would have been all that was necessary.

So perhaps after all the topic is not untimely.

DEFECTS OF THE TOE NAILS

(INGROWN AND VERTICAL)*

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SANTA ROSA, CALIF.

THE literature on this subject seems rather meager when we consider the frequency with which we see both ingrown toe nails and the vertical nails.

"Ingrown" toe nails is a misnomer, since the nail is really *overgrown* by the soft parts. Failure to trim the toe nails squarely across the end, which would allow the distal corners of the nails to over-ride the soft parts, is responsible for much of this condition. Narrow toed shoes, low hard toe caps, socks too long or too short, are also blamed in most articles on the subject. The nail, however, is only a passive offender, and when properly trimmed straight across, leaving the corners square, and not too short, it is practically impossible for the condition to occur.

Vertical toe nails are usually a result of incorrect fit of shoes (too short), in which the crowding of the soft parts of the toe into the end of the shoe results in pushing up the flexible nail. The matrix becomes hypertrophied, and a thicker nail is formed.

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In cases of ingrown toe nails of long standing, exudate forms in the nail sulcus as a result of the combination of infection

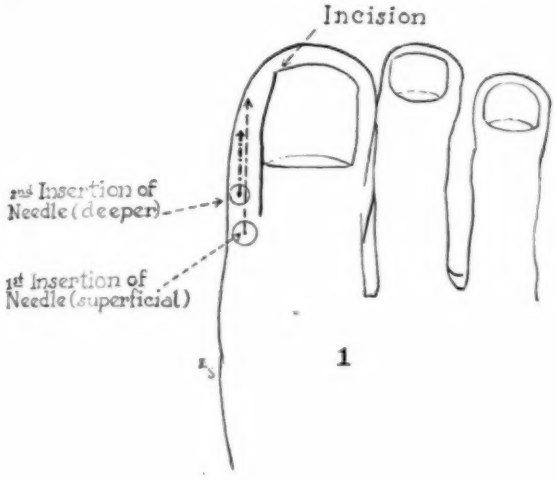

Fig. 1.

and trauma, with the inevitable tendency to form tender granulation tissue. By the time the average case reaches the office, the surrounding soft parts are thickened

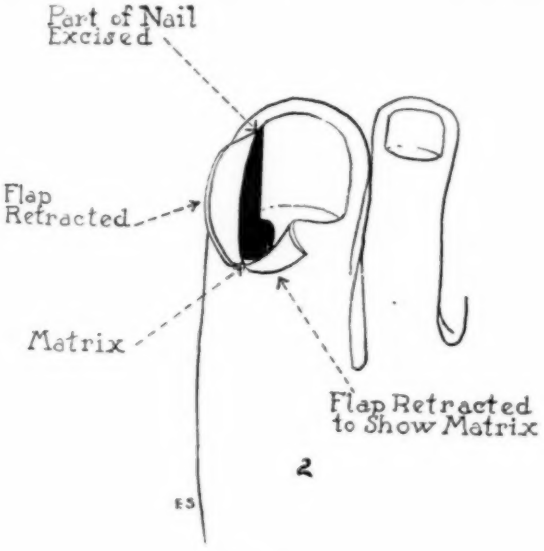

Fig. 2.

and infiltrated, and palliative measures are a waste of time. Salves have usually been tried before the doctor sees the case, and in the past few years the patient has often secured temporary relief from epsom salts soakings.

Palliative measures, such as gauze soaked in celluloid solution, laid under the corner of the nail, or a thin strip of gutta percha, often act as a traumatizing factor if worn for any length of time, but do give

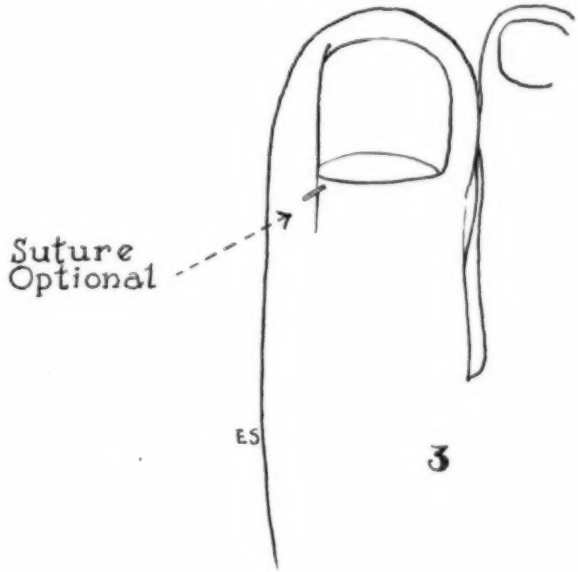

Fig. 3.

temporary relief. Micker of Berlin uses the former method, repeating the process after a few days.

OPERATIVE TREATMENT

The main object being to secure permanent relief by preventing recurrence, operation is aimed at the section of matrix from which ingrown section of nail is formed. If this matrix is not destroyed, nothing permanent has been accomplished.

If the case presents badly infected toes, a dehydration of the tissues by soaking in a strong solution of magnesium sulphate greatly lessens the angry appearance, and shortens the healing time. For two or three days before operation, the patient is asked to carry out this soaking for twenty to thirty minutes twice daily. He is also asked to bring a soft slipper to wear home after the operation.

After iodine and alcohol preparation of the skin of the entire toe, a rubber band ligature is placed around the base of the toe to secure hemostasis. The operative field is surrounded with sterile towels, and with a 2 c.c. Luer syringe a solution of

1 per cent novocaine, with or without adrenalin, is injected into the dorsal surface proximal to the matrix, pushing the needle forward and injecting up to the base of the nail (Fig. 1), then around toward the plantar surface on the side to be operated on, and lastly proceeding distally to the end of the toe, injecting deeply in the last part. If both the edges of the nail require removal, a similar injection is made on the opposite side.

The technic of Von Bergman of the Roosevelt Hospital has been found very satisfactory. Within two or three minutes after the injection of the local anesthetic, incision is made on the dorsal surface, beginning at the cutaneous junction 1 cm. inside of the mesial border, and extending 1 cm. backward so as to expose the whole depth of the matrix at this point when the flaps are retracted. (Fig. 2.) The incision is then carried forward along the mesial side of the nail to the distal end. The flap is so dissected that the entire nail edge and corresponding matrix is exposed, leaving the epithelium of the nail sulcus to be removed with the nail margin. The lateral margin of the nail is now excised, together with its matrix and nail sulcus, and with a small sharp curette all particles of the matrix and epithelium and scar tissue are removed.

The flap is now replaced (Fig. 3) and most operators do not use stitches, but press the flap down firmly and gently bandage over a vaselined gauze compress dressing. In cases where there is but little inflammation, one stitch placed where the incision was begun at the nail border seems to facilitate union, and does not interfere with drainage.

The soft slipper is worn for a week, dressings being changed daily for the first three days, then every second or third day until healing is complete. It is always necessary to soak off the first dressing but not subsequent ones. The patient should not use the foot for three days.

After ten days an ordinary shoe may be worn, provided the patient has remained off the foot for the first few days. Rapidity of healing is in direct proportion to the length of time the patient remains off the foot after the operation.

The above procedure is practically that of von Bergman at Roosevelt Hospital; the "one-slice" operation of cutting, which the writer has seen others do, leaves much scar and thereon much tenderness with slower healing.

G. E. Ney's method pays no attention to the nail, removing soft parts only, saving skin flaps to cover the area from which the tissues external to the nail have been removed. It may be successful if it is followed by correct trimming and correct footwear.

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RATIONAL USES OF PHYSICAL ENERGIES IN OTO-RHINO-LARYNGOLOGY*

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EFFORTS to rationalize the uses of light, heat, and electricity in oto-rhino-laryngology have occupied workers for more than a decade. The administration of thousands of treatments with physical agents in affections of the ear, nose and throat has resulted in the accumulation of a vast amount of clinical evidence, an analysis of which has enabled the writer to present this resumé of the subject. It is admitted that often the work was carried on strictly for experimental purposes, with no more sound indication than pure empiricism. At other times, the enthusiasm of successes in small series of cases warranted thorough and painstaking trials over a space of time. And still during some periods, the suggestions and experiences of foreign and American investigators in the field seemed to offer sufficient inducement to carry on clinical researches, even though personal endeavors had previously been convincing of either failures or results inferior to those obtainable with customary procedures. These are reasons sufficient to justify the efforts expended, for in no other way would it be possible now to arrive at some definite conclusions concerning the status of physical therapeutics in the specialty. Unfortunately, the amount of laboratory experimentation has been limited. However, as has been stated, an overwhelming collection of clinical data is available, and this must serve as the criterion until more basic studies are made.

RADIANT HEAT LIGHT AND INFRA-RED THERAPY

The utilization of infra-red and luminous rays in oto-rhino-laryngology has served primarily in the acute infections. The infra-red is characterized by long wave lengths, the luminous rays by shorter wave lengths. The former extends from 64,000 to 6500 Angstrom units; the latter from 8000 Å. units in the red to 3900 Å. units in the violet. The principal local effect of infra-red radiation is the production of hyperemia. Luminous rays have relative photochemical properties, while the immediate action is that of hyperemia and stimulation of lymphatic circulation. All wave lengths of radiation appear to possess some heat properties and the ability to influence chemical reactions. The sources of such radiation are used for palliation of pain or for retardation of inflammatory processes.

That heat may relieve pain is an accepted fact. It acts by diverting blood from congested parts through the production of a collateral hyperemia or the relief of vascular stasis. Heat may lessen nerve sensibility, the result of inhibition acting through the temperature nerves of the skin. The production of hyperemia by the application of heat to a part raises the local tissue resistance by (1) an increased local nutrition, (2) an increased metabolism, and (3) an increased number of phagocytes in the tissues.

Acute Otitis Media. In acute otitis media two immediate factors are definitely called for: (1) relief of pain, (2) drainage. Heat has long been used in this disease for its analgesic properties. Either the infra-red or the radiant heat lamp is superior to any of the older heating sources. The radiation is more uniform and more easily controlled. Its action is decidedly more pronounced. Heat radiation, from any source, is not, however, a substitute for paracentesis of the drum membrane, if this procedure is definitely indicated. Its value is in no way lessened after

* Submitted for publication August 1, 1929.

paracentesis has been performed, for here again heat is the measure of choice, and the facility and satisfaction of applying either the infra-red generator or the radiant heat lamp are well recognized on the basis of clinical experience. Drainage is more quickly promoted and continued and the progress of inflammation retarded. Factors in the treatment which influence results are: (a) good apparatus, (b) long applications at regular intervals, (c) regulation of apparatus and adjustment of distance from ear, permitting radiations of thirty minutes without intolerant effects or untoward reaction of skin surface.

Acute Nasal Sinusitis; Acute Coryza. After the usual treatment providing increased ventilation and drainage, the application of radiant energy has acted as a valuable aid. The principle underlying the application of heat in acute sinusitis is well established. The suggestion here is simply that of an improved source, either the infra-red generator or the radiant heat lamp.

There are practically no contraindications for the application of either the luminous rays or infra-red in acute disease. It is extremely important, however, that their continued applications be not depended upon to do what surgery or other measures usually accomplish promptly. They are not substitutes for other methods of treatment, but, as has already been emphasized, the sources of the energy are improved means of heat generation by which such physical force can be applied in a simple manner and with maximum effects.

ULTRAVIOLET LIGHT

The spectrum of sunlight is limited on one end by infra-red and on the other by ultraviolet rays. The ultraviolet rays are obtainable from the sun, and to some extent by reflection from other natural sources. Artifically for therapeutic purposes, this energy is obtainable from carbon or impregnated carbon arc lamps and from quartz mercury vapor burners.

The data upon which conclusions are drawn in this report is based altogether on mercury vapor quartz lamps, the water-cooled for localizing action and the air-cooled for systemic effect. Ultraviolet rays penetrate tissue much less than 1 mm. The ratio of penetration between skin and mucous membrane is not definitely known, but a comparison of tolerance between mucous membranes of different organs has been worked out roughly by clinical observation. Thus the tolerance of the mucous membrane of the pharynx is small as compared with the tolerance of the mucous membranes of the nose, the ratio being about 1:10 in the average patient. Certain factors influence the tolerance of ultraviolet irradiation of mucous membranes, the chief ones probably being the vitality of the tissue, the presence of excessive moisture and unusual amounts of mucous or other secretions.

As compared with the wave lengths of the other rays already described, ultraviolet ranges from 4100 to 1860 Å. units. Ultraviolet radiation such as is normally present in sunlight tends to stimulate the endogenous growth of cells, accelerates the life cycle and therefore hastens death, whereas the longer wave lengths of light are necessarily of exogenous development and the continuation of growth and repair of waste in the cell.

Ultraviolet radiation has a bactericidal action, which is, however, very superficial. Intense radiation has a destructive action on tissue cells. Ultraviolet light produces certain changes in the blood. The speed of reaction is influenced, both the oxidation of chemical compounds in the presence of oxygen and their reduction in the absence of oxygen. Respiration is influenced, breathing becomes slower and deeper. Other changes have also been noted, further work being necessary to act as confirmation.

Pharynx and Oral Cavities. Opportunities to treat tuberculosis and lupus of the pharynx and oral cavities are not so great in clinic and private practice. The few cases which have been attended responded favor-

ably. As Cemach has remarked, "Owing to their easy accessibility, oral and pharyngeal mucous membranes have been proved to be the most satisfactory objects for local light therapy." Cemach's series consisted of 13 cases thus treated, tuberculosis of the pharynx 3, of the cheek 3, of the tongue 2, of the gums 1, and further 4 cases of lupus. Twelve cases were cured completely, while one was only improved. Cemach also quotes Wessely who treated 35 cases with 28 recoveries, and Schreyer who treated 15 cases of lupus with 14 recoveries. Spitzer (Lupus Institute, Vienna) has treated 6 cases of acute tuberculosis of the oral membrane with good effects.

In disease of the tonsils little or no curative action is obtained with localized ultraviolet irradiation. This, in spite of the fact that many enthusiasts claim all sorts of favorable reactions. In isolated cases, occasionally, some good results were obtained, but the difficult problem of controlling these results renders them questionable. Likewise, the uniformly good results of some in treating Vincent's angina with quartz light have not been duplicated by the writer.

The Nose. Skin conditions of the external nose sometimes respond favorably. This has special reference to the eczematous eruptions. Acne rosacea is rarely affected. Tuberculosis and lupus of the nasal membranes, unless easily approached, do not react well to ultraviolet, although frequently this agent serves as good adjunct treatment. So far as other localized intranasal diseases are concerned, ultraviolet irradiation cannot be said to produce uniform results of any kind. Now and then a favorable action is secured. In general it may be said that ultraviolet light produces a bactericidal action on that part of the mucous membrane which the radiation reaches, this action for certain organisms varying with the radiation time. There is nothing accomplished in nasal accessory sinus disease by *intranasal* irradiation of quartz light.

The Ear. Skin affections, especially lupus, react well to ultraviolet irradiations and good results are the rule. Certain types of middle-ear suppurations frequently improve, and in some, suppuration ceases when treated with quartz light. No definite indications can be made and the only test is the therapeutic one. Cemach states that middle-ear tuberculosis reacts to all forms of ultraviolet light. He also recommends the resorbing effect of the quartz light as postoperative treatment of septic ear cases. This appears to be a logical and reasonable indication.

The Larynx. What has been said regarding the treatment of tuberculous conditions of the pharynx and oral cavities applies here. Few cases remain under treatment at the clinic, practically all of them sooner or later being referred for sanatarium care. No definite statements can therefore be made from personal observation. The largest number of cases reported upon in the literature is by Strandberg of the Finsen Medical Light Institute. A late communication embraces 203 cases, mostly of moderately severe and severe tuberculosis of the larynx. The majority of these were ambulatory cases of which number 55.6 per cent were clinically cured. Strandberg's methods include the use chiefly of general irradiation with carbon light baths without local irradiation of the center of the disease. The quartz light is employed on exceptional occasions.

THE GALVANIC CURRENT

This current may be derived from a wet cell, a dry cell or batteries, or from the lighting mains through a motor generator set. When the current from the mains is alternating in type a motor transformer or electrolytic rectifier is necessary to change it over to a direct current.

Galvanism is employed either for its polar effects or for the ionization of certain drugs or metals. Such terms as cataphoresis, anaphoresis, iontophoresis, ionic medication are more or less synonymous and vary only in technical detail. The action of the galvanic current is

primarily a chemical one. The contrasting reactions between the acid positive pole and the alkaline negative pole are proved by simple laboratory test. When applied to tissue the positive pole acts as a vasoconstrictor, the negative as a vasodilator. The action on metals of the two poles is sometimes of interest. The positive pole oxidizes and corrodes metals. The negative pole has no power of oxidation. It is said that the positive pole has distinct sedative properties in contradistinction to the irritant action of the negative pole. This sedative effect of the positive pole cannot, however, always be demonstrated clinically.

Ionization is defined as that treatment which consists in the introduction into the tissues of minute particles called ions by means of the electric current. Bases, metals and alkaloids are electropositive and therefore should be placed on the positive pole. Acids and acid radicals are electronegative and should be placed on the negative pole.

In otolaryngology, medical ionization has been used to advantage for two very definite indications, chronic suppurative otitis media, and chronic intumescent or moderately advanced hypertrophic rhinitis. It should be emphasized, however, that only selected cases of either of these conditions respond favorably to ionization.

Chronic Suppurative Otitis Media. The technic of zinc ionization as suggested by Friel is the only one which has been used. In selecting cases for this method an attempt has been made to follow the rules laid down by this worker. "Tympanic sepsis, meaning by this, infection of the discharge rather than infection of the living tissues, is clearly a case for antiseptic treatment such as zinc ionization." The perforation in the drum should be large enough to permit the zinc solution to enter the middle ear, or if this is not the case, a small cannula should be employed to introduce the fluid. Occasionally the ischemic action of adrenalin, or a combination of cocaine and adrenalin solutions, serves to give better access to the perforation. Only simple uncomplicated chronic otorrhea is an indication for zinc ionization with anticipation of a curative result. Other types of middle-ear suppurations sometimes react favorably by way of improvement for longer or shorter periods of time, but the experience of many clinicians has shown that in the presence of any complicating pathology permanent cessation of the aural discharge does not occur. Friel advocates zinc ionization for indications other than mentioned, but the writer has limited himself both in his clinic and in private practice to this very definite indication.

Nasal Zinc Ionization. For intumescent rhinitis, and for mild forms of hypertrophic rhinitis, zinc ionization has been found to give more satisfactory results than many of the older non-surgical methods of treatment. The cases must be carefully selected, for there is no unanimity of opinion concerning the nasal structures involved. Likewise there is a difference of opinion on the part of some authors regarding the strict meaning of "intumescent" and "hypertrophic." In the early stages of simple chronic rhinitis, there are the usual inflammatory changes in the mucous membranes, but the thickening varies according to the duration and severity of the nasal involvement. The term "intumescence" implies a swelling, but not necessarily one of permanence. As Phillips puts it, "In the hypertrophic or hyperplastic form, chronic rhinitis is an inflammatory process which involves the nasal mucosa, more especially the turbinal tissues and is accompanied by permanent increase in the soft tissues and changes in the character of the secretions." Markedly advanced rhinitis with fixed connective tissue or polypoid changes should be excluded as an indication for zinc ionization. The method of treatment of zinc ionization is simple and can be carried out in very young children as well as in adults. In older children, in particular, it is of merit because it sometimes relieves the

nasal symptoms of obstruction until such a time in adult life when surgery can be instituted if so desired. Long strips of narror gauze packing saturated with a weak solution of zinc sulphate (0.5 per cent) are packed into the nasal chamber to be ionized. Every surface of mucosa should be covered down to and below the inferior turbinal. The moistened gauze is a conductor of electricity and when the current is turned on, only those parts will be ionized adequately which have been brought into the circuit by good contact. The positive pole of a galvanic current is connected with the wet nasal packing, the negative pole to a large wet pad on the forearm or other surface. As has been frequently stated, the current must be controlled from the lighting mains by a generator set. In fact, this is the most desirable plan at present, because the set has a milliamperemeter, polarity changers, indicators and such other refinements as make for perfected technic. Up to 10 ma. may be employed for from ten to fifteen minutes. The maximum effect should be reached after ten minutes. As a general rule only one ionization is necessary, but occasionally a second or a third treatment makes the result of relatively longer duration. There is no reaction which causes any discomfort to the patient. Definite changes in the appearance of the surface of the mucous membrane occur. These are referrable to color and presence of secretions, both of which are altered immediately, due to the surface action of the zinc and the pressure of the packing. The electrolytic effect is undoubtedly also a surface one, but must be studied microscopically to be described accurately.

F.H.B. Norrie advised the use of zinc electrolysis for enlarged inferior turbinals, as an alternative to the cautery or turbinectomy. Its chief advantages are absence or minimum reaction and no destruction of nasal tissue. Norrie uses preliminary cocainization. The needle is inserted into the turbinal and pushed along it under the mucous membrane and close to the bone for whatever distance is considered necessary, care being taken that the needle does not puncture the mucous membrane again further back. The current is increased up to 10 ma. and continued for ten minutes, after which it is slowly reduced and reversed for a few minutes so as to allow easy withdrawal of the needle. A pure zinc needle, properly insulated, is essential for the avoidance of burns of the mucous membranes.

DIATHERMY

To the best of our present knowledge, diathermy is a form of thermotherapy which utilizes electrical energy for the production of thermal effects in the depths of the tissue. The rise of temperature is said to be proportional to the amount of resistance encountered by the current. Medical diathermy is differentiated from surgical diathermy by the destructive action of the latter which is produced by carrying the heating effect beyond physiological limits. Whether heat is the one and only physiologic action of diathermy is at present a mooted question. If other effects are produced they have not as yet been conclusively demonstrated either by laboratory or clinical tests.

The chief indications for diathermy are deep seated affections. In such it may be employed independently or combined with other agencies such as galvanism, sinusoidalism or the *x*-ray.

A diathermic current has no polarity, and therefore reference to polar action or usage is erroneous. It is said that heat is generated in the tissues in proportion to the square of the amperage employed and the resistance of the tissues to the passage of the current. It has been stated also that the high frequency current because of its high voltage, is probably able to take a direct path through the tissues and is not influenced materially by their relative resistance. This latter contention has not been conclusively proved and is therefore open to argument.

Briefly the physiologic effects of medical diathermy may be classified as local and

general. Logically the resultant action of diathermic application include (1) mild skin hyperemia, (2) sedation, (3) improved blood and lymph circulation. Factors which will alter the degree of either of these actions are duration of treatment, size of electrodes and frequency of administration. When uniterminal diathermy is used, because of the higher frequency and higher voltage, the heat produced is more superficial and cannot be localized or directed into deeper tissues. The body acts as a condenser to these currents which are easily diffused and dispersed and not easily controlled. The local effects of surgical diathermy depend on the intensity of tissue destruction desired, and this depends on the utilization of electrocoagulation, electrodesiccation, or fulguration. When either of these is employed, marked reaction of the tissues takes place. Edema and sloughs are of common occurrence.

The general effects of diathermy, aside from the slight elevation of body temperature, are more or less conjectures. It is true that a lowering of systolic blood pressure has been noted, but this lowering is usually not of a permanent nature except in isolated cases. In otolaryngology the local effects of diathermy are of chief importance. Therefore, further consideration of the general action will not be discussed.

Nasal Accessory Sinus Disease. Before applying medical diathermy to a diseased nasal accessory sinus, the case must be carefully selected for this treatment. Clinical diagnosis should be supported by roentgenographic evidence so far as this is possible. Diathermy is not indicated in the presence of pus in a sinus cavity unless adequate drainage has been provided, nor is diathermy indicated in any instances in which surgery has been established as the rational therapy. An example of this is polyposis or polypoid degeneration of the mucous lining. There are numerous instances, however, of sinus disease without surface suppuration of the mucosa, which give symptoms of pain or discomfort, and tenderness. Irrigations often prove valueless. Surgery might prove beneficial, yet conservative measures merit a trial first. It is for such an indication that diathermy has proved beneficial.

The frontal and maxillary sinuses are easily accessible and lend themselves to direct diathermy. Heat within the tissues of the sinus cavity is effected by this method. It is analgesic in acute, subacute and chronic involvement, lessens symptoms by its ability to produce a local active hyperemia and improves the blood and lymph circulation to the part. Thus tissue drainage is promoted.

Experience has demonstrated that whereas the frontal and maxillary sinuses respond favorably to diathermy when heat is an indicated factor in the treatment, inaccessibility of the sphenoid and ethmoid sinuses has caused difficulty in the technical application of the direct method. The results in sphenoid and ethmoid disease have not been satisfactory, and until scientific means of administering the energy are devised, negative results may be anticipated.

The value of diathermy as an aid in the postoperative treatment of sinuses has recently been suggested. This is especially noteworthy when healing is delayed for some reason, such as devitalization of the part. On the whole, diathermy cannot be said to replace any of the usual procedures, medical or surgical. It is, however, an added means at our command for conservative therapy and should be thoroughly tried, particularly when other methods have been ineffective. Results will depend on correct technic, good apparatus and individualization of treatments, based on the existing symptoms and pathology.

Chronic Middle Ear Deafness. An analysis of over 300 records of patients with middle-ear deafness selected for diathermic treatment shows that improvement was obtained in 50 per cent of the cases. In each instance the diagnosis was made by

the usual tuning-fork tests and by the whispered and conservational voice tests. The audiometer was used as a final aid and also in checking progress of patients under treatment.

The method of diathermic application consisted of placing the smaller or active electrode over the mastoid region of the affected ear and the larger or indifferent electrode on the opposite side of the face, approximately over the area of the malar bone. Three to six treatments were given weekly, each treatment being of twenty minutes' duration.

Diathermy has benefited some patients with middle ear deafness after other methods had failed. In the experimental studies conducted during the past six years, cases were always carefully selected on a treatment basis and controls employed to evaluate each form of therapy, singly or in combination. Routine measures are never contraindicated. On the contrary, they sometimes are more effective with the adjuvant use of diathermic therapy.

Physical agents have failed to yield favorable results in advanced middle ear deafness, and in otosclerosis and nerve deafness. In fact, exaggeration of symptoms has been frequently noted when these types of impaired hearing have been under the influence of diathermic administration.

There is still much to be accomplished in the treatment of partial deafness with physical methods. General utilization by otologists of diathermy and other physical agents is warranted, not only on the basis of the experimental work already done, but in the hope that further progress will result.

OTHER USES OF MEDICAL DIATHERMY

Medical diathermy has been used experimentally and empirically for a number of affections in otolaryngology. There is yet to be established a definite rationale for indications other than those already discussed. There is little doubt concerning the value of uniterminal diathermy for certain endonasal indications, but until further evidence is presented to augment what proof is now available, its employment must be regarded simply as an empiric form of therapy. Diathermy is now being utilized in chronic non-specific laryngitis and tracheitis. Further work is necessary to demonstrate its merit for these affections.

SURGICAL DIATHERMY

As a local agent for the destruction of new benign or malignant growths, surgical diathermy represents one of the true advancements of modern surgery. Its usefulness lies chiefly in its ability to destroy accessible growths with a minimum of hemorrhage and without danger of dispersing cancerous cells. Various technics for electrocoagulation have been suggested. The cutting current is now extensively employed for mass extirpation. No one method has proved ideal. Individualization is essential and the surgeon who adopts a certain technic on the basis of surgical indications will obtain the best results.

Surgical diathermy is the agent of choice for malignant growths of the antrum, the tongue, the lips or the larynx. Complete and permanent eradication of accessible neoplasms of the ears, nose, or other easily approachable parts of the head and face will depend on the type of growth encountered. Biopsy is important and histologic study of the removed tissue is always necessary to determine the value of follow-up treatment.

Carcinoma of the larynx can be approached in two ways: by suspension preceded by tracheotomy, or by laryngofissure. Obviously the choice of approach will depend on the extent of the growth and the condition of the patient. The permanency of results can only be predicted by the absence or presence of metastases. The difficulty has always been in getting patients early enough, before the glands have become involved, for the prognosis

is in direct relationship to the localization of the growth.

The problem of anesthesia in connection with surgical diathermy has always been seriously considered. Much work has been done with rectal and spinal anesthesia. Certain new drugs have been tried. The matter is still unsettled, but with the experimentation now being indulged in some good should result.

SUMMARY AND CONCLUSIONS

1. While physical therapeutics in oto-rhino-laryngology is still more or less experimental, a vast amount of clinical evidence is available to prove the usefulness and rationale of certain physical energies in selected cases which come in the scope of the specialty.

2. Radiant heat-light and infra-red are serviceable in acute otitis media, preoperatively and postoperatively, and in acute upper respiratory infections.

3. Ultraviolet energy has proved beneficial for tuberculosis and lupus of the pharynx, larynx and oral cavities and for some skin affections of the nose and ear.

4. Zinc ionization for selected cases of chronic suppurative otitis media and for intumescent and moderately advanced hypertrophic rhinitis represents a definite advance in the therapy of these diseases.

5. Medical diathermy is of value in acute and chronic forms of frontal and maxillary sinusitis, but must be employed with due regard for underlying factors, principally that of drainage when suppuration is present.

6. Middle-ear deafness is an indication for medical diathermy, especially after the usual methods have failed to bring about improvement. Recent reports by Hilliard and McKenzie appear to confirm the results reported upon earlier by some foreign and American otologists.

7. Surgical diathermy is unquestionably the agent *par excellence* for the destruction of accessible new growths, whether benign or malignant, providing, however, there is absence of metastatic involvement.

THE SEDIMENTATION TEST

A SUBSTITUTE FOR THE LEUCOCYTE COUNT*

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NUMEROUS articles have appeared in the literature from time to time on the erythrocyte sedimentation test. Friedlander in this country was among the first to advocate its use. Baer and Reis, Polak and Mazzola, Schmitz and Schmitz, and others, have reported their experiences. Opinion is almost uniform that taken in conjunction with the physical findings, the sedimentation test is of definite value to determine the presence or absence of infection.

The rate of settling of the red blood cells from a citrated column of serum, when allowed to stand, is known as the sedimentation time. While its use has been more or less confined to hospitals, and especially to gynecological departments, the simplicity of technic makes it both practical and valuable for office practice.

TECHNIC

Draw 0.2 c.c. of a 5 per cent sodium citrate solution into a 1 c.c. graduated tuberculin syringe. With a small hypodermic needle attached, draw 0.8 c.c. of blood from one of the small veins in the

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arm, thus making 1 c.c. of a solution of citrate blood, which is placed in a standard calibrated tube. Shake thoroughly by inverting the tube, and take the time. When the erythrocytes have settled to the 18 mm. mark, leaving the clear serum above, take the time again. The difference in minutes is the sedimentation time.

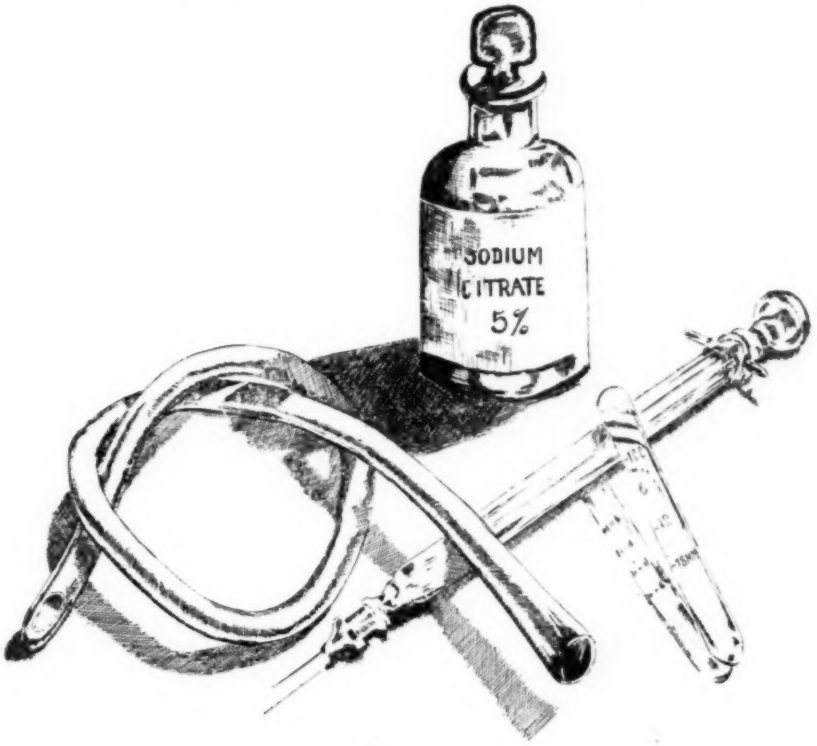

Fig. 1.

The normal rate for the average healthy individual is about 120 minutes. The following readings show some of the common infections and their locations:

	Minutes
Infected abortions	30
Pelvic abscess	16
Breast abscess	23
Active salpingo-oophoritis	38
Parametritis recent	36
Fibroids and pelvic infection	65

When the rate is below thirty minutes, localized accumulation of pus either in definite abscess formation or in minute foci will be a constant finding.

Certain conditions named below show rapid readings not accounted for by infection:

	Minutes
Normal pregnancy	110
Postpartum afebrile	52
Abortions, 2 to 3 mos	68

Here some absorptive phenomena must account for the rapid settling of the cells.

In malignancy, the rapid readings are due to a secondary infection of the malignant growth.

Following operation the rate drops thirty or fourty minutes, but within a week's time it is again nearly normal. The absorption from tissue destruction may account for this change.

In secondary anemia the rate is not materially altered; when it is, a careful search for foci of infection will usually explain the change.

In elective operations, one is certain to meet with cases where although physical findings and the temperature are normal, infection is suspected. It is in this type of case that the test is of most value. Whenever the rate is below ninety minutes, operation should be postponed until the

rate is normal or sufficient time has elapsed under conservative treatment to make it apparent that operative interference is essential for recovery.

In fibroids associated with pelvic infection, the rate in 37 cases examined at the Long Island College Hospital in Brooklyn was sixty-five minutes. In every case foci were found to substantiate this determination. In most cases under expectant treatment the rate would approach normal in a few weeks, and operation was then performed. When cases were operated upon with a sedimentation time of less than ninety minutes, the postoperative course was attended with more complications, and the convalescence prolonged. The end-result of the operative procedure was also less satisfactory.

In the diagnosis of ectopic pregnancy of recent origin or rupture, the sedimentation rate will be normal. In 25 such cases the average rate was 108 minutes, compared with 32 of acute salpingitis, showing an average rate of thirty-six minutes. In both conditions the physical findings, leucocyte count, and temperature may be entirely similar. A slow rate, or one approaching the normal, will suggest ectopic pregnancy, while a rapid rate will indicate that an active infection exists. In old ectopic cases, rapid readings are due to infection of the blood clot in the peritoneal cavity.

A tubal insufflation test should never be done in the presence of infection. A sedimentation rate will diagnose infection, if present.

If a test aids our diagnostic methods, it will be added to routine laboratory analyses in hospitals; but, if it is the least bit difficult it cannot be used in office practice. The leucocyte count is not done in most physician's offices unless he is equipped with a laboratory technician. The solution and pipettes require considerable care. A microscope is also necessary. The information obtained by leucocyte count is no greater than that determined by sedimentation. In addition the sedimentation rate is much more simple, requires no elaborate technic, and may be done by anyone in his office capable of doing a venous puncture.

CONCLUSIONS

1. A rapid rate means infection, a slow settling of the red blood cells eliminates this possibility.

2. It can replace the leucocyte count because it gives as much information and is not subjected to so many changeable factors.

3. The diagnosis of latent or quiescent infection is a valuable adjunct to elective surgery.

4. It will be found to be of value in diagnosis of ectopic pregnancy.

5. It is simple to perform and therefore may be used in office practice.

REMOVAL OF FOREIGN BODIES FROM HANDS, FINGERS AND FEET*

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THE frequency of the incidence of foreign bodies in the hands and fingers and the relative ease with which those more superficial can be excised, makes the problem of their removal of interest not only to the surgeon but to the general practitioner as well. That often the search for foreign bodies taxes the patience and skill of the operator would indicate that unless the offending body is superficial

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and easy of approach, it were best left for removal in the hands of those trained by experience to do this.

Because the relative frequency of foreign bodies in the hands and fingers is much greater than in the feet, and since the principles advocated apply to both, this article will concern itself chiefly with the removal of foreign bodies from the hands and fingers and limit itself to those foreign bodies visible in the *x*-rays.

Certain general principles applicable to foreign bodies anywhere, and to the hands and fingers particularly, present themselves as a working basis in the management of foreign bodies, as follows:

1. Most foreign bodies are a source of irritation, either immediate or remote, and wherever possible should be removed.

2. Early removal makes for easier removal and prevents slipping and progression of the foreign body along the tissue planes.

3. Where the foreign body is sharp and pointed, as a needle, pin, nail, etc., early splintage of the part maintains the relation of the foreign body to the tissues similar to the time of entrance and makes localization and removal easier.

4. The introduction of a foreign body into the tissues not made with surgical intent produces an infected punctured wound which should be sterilized by the injection of 3½ per cent tr. iodine by means of a hyperdermic needle, if the condition is seen early.

5. Where contamination by street dust is suspected, a prophylactic injection of tetanus antitoxin should be given.

6. Localization of the foreign body should be made before any attempt at removal is initiated as it saves embarrassement and facilitates the operation. For this purpose the use of a skin marker after visualizing the foreign body by means of the fluoroscope and projecting on the skin its approximate localization, is of material aid. *X*-rays in two planes, anterposterior and lateral, should be before the operator while working, thus determining the relation of the offending body to the hard parts and the vital soft structures. The use of the tell-tale marker preliminary to the *x*-ray is of decided help in some cases. The use of the fluoroscope, where available, is of great value in extracting foreign bodies. Where neither the *x*-rays, nor the fluoroscope are available, transillumination with a strong light in the dark may give a clue as to the location of the foreign body. Discoloration of the deeper parts by the foreign body in its passage into the tissues may be a clue to finding it.

7. Anesthesia, either local or general, should be used. Where local anesthesia is used, ½ per cent novocaine solution injected at the root of the fingers to block the digital nerves for finger work; or at the wrist to block the median and ulnar nerves for palm work; or infiltrated locally over the foreign body, produces adequate anesthesia for the removal of the ordinary foreign bodies. Where the foreign body is located in the hard parts and requires bony excision, general anesthesia is preferable.

8. Drainage. Assuming that every foreign body not introduced aseptically may produce an infected wound, we prefer to drain every operative wound after the removal of the foreign body. For this purpose we use a sterile rubber-band drain.

9. The use of natural or electro-magnets has, in our experience, proved most ineffectual in the removal of foreign bodies of the hands and fingers.

10. While it is the writer's conviction that the best surgical work can be done only under proper condition, preferably in an operating room, yet where the foreign bodies are in the fingers or superficially situated in the hand, they can be removed at the office.

Surgery of the hand and fingers presents a difficult problem both because of their anatomic structure and function of these parts and because of the susceptibility to, and easy destruction by infection of some of the more important structures

found here. The sloughing of tendons as well as destruction of the phalanges, following hand infections, with subsequent deformity of the fingers are well enough known to be mentioned here only in passing; and it is because of the easy destruction of these structures that any operative procedure undertaken here should be looked upon in the light of a major, rather than a minor surgical problem. The relative functional value of the different fingers should also be considered, and it should be remembered that they are important in the order named: thumb, index, middle, little and ring fingers. Foreign bodies are potential sources of introducing infection and, therefore, are important factors in hand infections.

Fig. 1. Foreign body imbedded in head of metatarsal of little toe.

Fig. 2. Skin marker almost overlapping foreign body.

PROCEDURE OF REMOVAL

Fingers. When a foreign body is situated in the fingers its removal is often an easy matter if one bears in mind the important anatomic structures here (digital vessels, nerves and tendons), and incises parallel to these. If the offending object is elongated and parallel to these structures, the usual incision, bisecting the foreign body, is made with a knife through the skin only, and further exploration is made with a blunt instrument, as an artery clamp,

Fig. 3. Skin marker projected approximately over foreign body.

until the familiar gritting sensation of metal-to-metal contact is sensed, and the object is grasped and extricated. When possible cutting across the pad-like cushions at the tips of the fingers, as well as the anterior surfaces of the closed spaces, is to be avoided, as scarring here may interfere with the important tactile sensation located over these areas. Where the foreign body is impacted in the bone, it is best approached from the side of the finger, making a generous incision for an adequate exposure.

Hand. In the palm, searching for foreign bodies becomes more difficult, both because they have a deeper range of penetration here, and the anatomic structures are more extensive. The superficial and deep vascular palmar arches and the neural palmar arch as well as the numerous flexor tendons here should be remembered and avoided. Where the foreign body is superficially located, incision with a knife is made through the skin only, bisecting the foreign body and sufficiently large to give a good visual exposure. Blunt dissection with the tip of an artery clamp is then carried out until contact is made, as in the fingers, When the foreign body is deeply located, below the palmar fascia or in the palmar spaces, its removal may be quite difficult. It sometimes becomes necessary to make a more extensive exposure than a linear incision bisecting the foreign body gives, especially where the foreign object is a needle lying at an angle between 45° to 90° to the skin surface and deeply imbedded in the palm of the hand. A flap incision in the skin, either surrounding the foreign body; or one leg of the flap bisecting, or as nearly as possible bisecting it, gives the advantage of increasing the operative field by retracting the flap. A good visual operative field, which really means a sufficiently large operative field, is essential for good work.

The following case is cited to prove that sometimes an apparently innocuous foreign body of long retention may become the irritative factor in a symptom-complex simulating another disease:

J. R. a well-preserved man of sixty years, presented himself in 1926 with the following history and findings:

For the past five years he had been suffering from a symptom-complex consisting in periodic pain, swelling, redness, and disability of the right foot. The pain would come at night more often and was of sufficient severity to require opiates for relief. The weight of the bed-clothing would produce pain so that a cradle was used for that foot. Medical attention here and abroad consisted in symptomatic treatment during the attacks and the general hygienic and medicinal treatment for gout in the intervals between attacks. The attacks would last four to five days and the pain would gradually become less and remain so during the free-from-attack interval which would last about four to six weeks. He presented an *x*-ray taken abroad about three years before where he was told that the buck-shot lodged in his foot, which he remembered being in there about forty years, had no relation to his condition.

Examination of the blood serologically, chemically and cytologically was negative. The urine and general body physical examination were negative. The right foot showed an atrophic condition of the skin over the dursum, otherwise the part was negative. Motion in the ankle and the joints of the tarsus and toes was normal. The free-from-attack period had lasted about three weeks at the time of presentation of the patient. An *x*-ray was ordered, and revealed the buck-shot as in the accompanying illustrations. Removal of the foreign body was advised and done. At operation the buck-shot was found buried in head of the metatarsal of the little toe with an associated periostitis of the metatarsal. Following the operation the patient had been watched and seen periodically for one year and during this time no attack has occurred. The removal of the foreign body stopped what seemed like a gouty symptom-complex.

INDICATIONS FOR DOING A MEATOTOMY & A SIMPLE TECHNIC THAT CAN BE DONE IN THE OFFICE*

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A NARROW meatus occurs in the distal 1 cm. of the urethral canal and is bounded by the external and internal meatus.

A narrow meatus exists in the infant when there is a small orifice that will not admit a No. 10 F. sound, and in the adult when it will not admit a No. 22 F. sound. The condition is the most frequent of any urological condition. It is the commonest cause of urinary obstruction with its serious sequel in infants. It is the most frequent cause of inadequate drainage of the urethra. The latter condition invites specific and promotes many non-specific infections. In cases there is an indication to instrument the urethra or bladder, it is the commonest hindrance. It may be congenital or acquired.

Meatotomy is one of the easiest and simplest of all operations. Yet it is probably the most neglected operation in the realm of surgery. The operation should be done in the office every time a narrow meatus is found to exist before attempting instrumentation of the urethra.

The technic I use is as follows: The end of the penis is washed with soap and water and the field of operation is anesthetized by inserting a cotton applicator soaked in 4 per cent butyn (adrenalin) solution. After this has been in the meatus for ten minutes, a sharp, blunt-pointed bistoury is nserted into the urethra, well within the second meatus, the head of the penis is compressed from side to side tightly, and the knife withdrawn, cutting the floor of the urethra to a depth that apparently removes the obstruction and eliminates the pocket that exists behind it. The desired result in skillful hands should be achieved with a single stroke. It is important to remember that the internal meatus, at the depth of 1 cm., is often tighter than the meatus itself. A No. 28 F. bougie is introduced immediately. If it will not pass readily, or catches on the constriction as it is withdrawn, further cutting is required.

If adrenalin has been employed, the bleeding is usually slight, but gentle lateral compression should be applied by the operator until it subsides. The patient is instructed how to stop bleeding by lateral compression of the glans penis in case there is a recurrence. It has been my custom to apply half inch bandage bound with narrrow strips of adhesive in such a manner that it compresses the edges of the wound, but permits the patient to urinate without removing the bandage. Then, I place a piece of sterile gauze over the end of the penis and fix it with a small rubber band. The latter is easily removed when the patient urinates. The patient is instructed to keep the wound anointed with sterile vaseline, and after three days, to keep the cut edges from healing by pulling them apart twice daily. No attempt should be made to pass a sound before one week has passed.

The results are uniformly good, and I have never seen any complications from a meatotomy other than slight bleeding, that is easily controlled by the patient.

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THE TREATMENT OF PARAPHIMOSIS*

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PARAPHIMOSIS usually occurs when a phimosis has been forcibly retracted behind the corona glandis, and remains there to produce a constriction. The inflammatory causes are blananitis, gonorrhea, chancre, chancroid, and herpes. Immediate treatment is indicated to prevent edema, ulceration and gangrene.

1. A simple paraphimosis can invariably be reduced without incision, if the following details, as enumerated by Keyes, are observed, viz:

(1) The stricture must be pulled well back. Exceptionally, the mucous membrane is unfolded at the dorsum; this must be smoothed out by still further retracting the prepuce.

(2) The edema must be thoroughly squeezed from in front of the stricture to the shaft of the penis behind it.

(3) Reduction is then accomplished by forcing the stricture slowly over the head of the penis. It is futile to attempt to pry the stricture over the glans until the edema has been reduced.

A liberal application of vaseline to the glans and prepuce will aid materially in persuading the stricture to slide over the glans. If a patient and skillful attempt at reduction fails, the stricture must be divided. Under local anesthesia, two longitudinal incisions are made in the depths of the constricting ring, which is above the edematous mass of skin and subcutaneous tissue, through the skin and subcutaneous tissue dividing the stricture until the prepuce can be easily drawn over the glans. The incisions should be about 1 inch long, and had best be closed transversely according to Heinecke's principle. This will enlarge the preputial orifice, cure the phimosis and prevent future paraphimosis.

2. In case a chancre or chancroid is the exciting inflammatory cause of paraphimosis, a bilateral slit (never a dorsal) should be made to make the source of infection accessible and to prevent the destruction of tissue. The quicker it is done the less obstinate the infection will be. Under local anesthesia, the mucosa should be divided with scissors down to the corona, and then the skin and subcutaneous tissue through and above the constriction until the prepuce is redundant. The division of the skin and subcutaneous tissue well above the constriction is important, because it eliminates the edema, and prevents the formation of that hard infiltrated mass on the ventral surface of the prepuce that always occurs after a dorsal slit has been made. A liberal incision extending 3 to 6 cm. above the stricture will usually suffice. Hemastasis is controlled by heat and ligature of the bleeding points with single No. 0 plain gut. This procedure will give good exposure to the lesions, and enable the operator to do dark-field examinations, and to treat the primary lesions and coexisting infection. Incidentally, there will be fewer cases of suppurative inguinal adenitis, and less destruction of tissue. The wound should be dressed with the flaps in their natural position to prevent constriction at their bases. The penis should be elevated. Continous application of hot Thiersch's solution will be found to be very efficacious in controlling the infection. After the lesions have healed, an acceptable circumcision can be done, under local anesthesia, by amputating the flaps at their bases.

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TUBERCULOUS LYMPH NODES*

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LYMPH nodes when infected by the tubercle bacillus become enlarged and firm, are usually painless and are affected in chains or groups. They may reach a stage in their enlargement when they become stationary in size or may even recede, to enlarge again in a short time. The process may cease with a firm enlargement but commonly a secondary infection is superimposed and suppuration follows. When this stage is reached the fluctuant node may become reddened, painful and tender. Occasionally when treated expectantly, the suppurative process may disappear, but usually the course is progressive and unless incision and drainage is resorted to, the suppuration breaks through the skin and a sinus is formed which is long in healing. With this progressive disease of long duration the treatment is tedious and discouraging to doctor and patient, and the direction of the treatment is of utmost importance.

This condition is usually found in children and young adults, 71 per cent of Clute's series occurring in patients under the age of thirty. In this series, 65 per cent of the patients were female and 50 per cent of the cases were confined to cervical nodes.

The majority of patients affected with tuberculous lymph nodes seek medical help with the complaint of an unsightly tumor. The complaint of pain and tenderness is the exception. The surgeon is usually confronted with the problem of treating a young patient who demands a satisfactory cosmetic result with the loss of the least possible time.

GENERAL TREATMENT

Fortunately the diagnosis of tuberculous nodes is a comparatively easy one to make, and once made, the proper procedure is to institute careful and systematic general treatment to increase the resistance and improve the health of the patient. The point is well known, but commonly slighted, and often a diseased node is conscientiously treated without success, while the poorly nourished host is neglected. Such simple measures as a carefully worked out diet, regulated rest, fresh air and sunlight should not be advised, but made a detailed part of the treatment. In most clinics cod liver oil is routinely given over a period of three to six months.

FOCI OF INFECTIONS

That the eradication of foci of infections is of great importance in the treatment of tuberculous nodes is not to be questioned. The teeth and tonsils are commonly considered the point of entrance of the tubercle bacillus. Davies-Colley and others think that tuberculosis results in a lymph node invariably as secondary to a pyogenic infection. In either case the foci of infection must be removed.

Diseased tonsils are undoubtedly causative factors in cervical tuberculous adenitis. Tonsillectomy may often be the only necessary operative treatment for the complete disappearance of the tumor. Tonsillectomy is of such prime importance in this condition that many surgeons advise it in all cases of cervical adenitis. The tonsils need not be apparently diseased, nor need there be a history of frequent attacks of sore throats or tonsillitis. It seems to be a matter of choice whether the tonsils are removed before or after a necessary excision of cervical nodes. This depends upon the stage of the disease in the nodes. In early cases without suppuration tonsillectomy would be advised pending decision as to radical excision. In the case of suppuration the local operative procedure should be ac-

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complished first. It seems unwise to attempt tonsillectomy at the same time as any cervical node operation although it is done with apparent safety in some clinics.

Other foci of infection, such as infected sinuses and external ear infections, should be carefully and energetically treated. The teeth are often symptomless harbingers of infection and should be carefully examined and *x*-rayed and abscesses and cavities eradicated. The scalp as a carrier of foci of infection is often overlooked, especially in children, whose pediculi may be the cause of continued scalp infection. The proper treatment of foci of infection is in a great measure responsible for the decrease in incidence of lymph node tuberculosis in the past decade.

LOCAL TREATMENT

There are two methods of treatment of tuberculous lymph nodes: (1) operative and (2) non-operative. Both are necessary and have their place in the proper handling of the case, the direction of the treatment depending upon the stage of the disease. The time element is often a question of importance to the patient and he may elect to undergo an operative procedure which will save time and expense, even though the chances of a cure by expectant treatment may be very good.

1. *Stage of Firm Enlargement.* During this, the early state of the disease, the choice of treatment is most important. It is at this period that the progress of the disease should be carefully watched, with the institution of the measures mentioned above. The lymphodenapathy may progress and recede in a relatively short time in the beginning stages and the patient usually demands local applications. Iodine and iodine salves seem to be most popular, but their usefulness is measured to a great extent by the psychic affect on the patient. Counterirritation is of doubtful value and care should be taken to warn the patient of skin burns. It is of course necessary to forbid any local applications, especially those containing iodine, during the course of *x*-ray therapy.

Conservative treatment in the early stages of the disease is the wise procedure. Radical dissection has been given up as a routine procedure in most clinics because of the resultant unsightly scars and the chances of nerve and vein injury, and because of the usefulness of other conservative methods of treatment. Heliotherapy is of great value in the treatment of the lymph node involvement as is it in any other type of tuberculosis. Natural heliotherapy alone in selected sites is sufficient to cure tuberculous lymphadenopathy but when used in conjunction with other methods is most effective. The quartz lamp is valuable not only as for its general effect but also for its local application to the enlarged nodes.

X-ray therapy is probably the most valuable single conservative therapeutic agent in this stage of the disease. In Hanford's series the usual dosage was about one-third of the dose of filtered roentgen ray necessary to produce a slight erythema in an average person. The number of treatments was about ten, given over a period of four and one-half months. His results justify the use of *x*-ray in all cases during this stage of the disease.

Radium treatment has shown approximately the same results but its use is more troublesome and more expensive. Desjardins of the Mayo Clinic advises *x*-ray treatment as the method of choice, while Bowing, also of the Mayo Clinic, advises radium.

If the conservative method of treatment does not give results that are satisfactory the ultimate result is of course excision of the affected nodes. Hanford states: "When a small group of definitely enlarged glands has been present in the neck for two months or over, in a patient who has reached the age of five years or more, we believe that their early and complete removal is the safest and best treatment which can be instituted." Exci-

sion of the nodes of course assumes removal of all the diseased process but does not infer a radical dissection of a complete chain.

2. *State of Suppuration.* In this stage of the disease the treatment should be operative. Incision and drainage of a suppurating node, with removal of as much as possible of the diseased process, is the most effective procedure. Conservative treatment, such as repeated aspirations with injections of bismuth or iodine preparations, more often results in ultimate sinus formation than in resolution. Silcock describes a method of treatment by drainage with a linen thread but this and other similar methods are inferior to operative procedure. Some patients seek treatment for the first time with a suppurating node and demand conservative treatment, and in such cases we use at the New York Hospital Durante's solution as modified by Hitzrot, which is injected into the aspirated node. After incision and drainage of suppurating nodes the cavity is filled with this solution and the wound sutured in selected cases. The formula is as follows:

Iodine	1
K.I.	1.5
Guiacol	5.
Glycerine	100.

For use in children 2 per cent guiacol is substituted.

3. *Stage of Sinus Formation.* *X*-ray treatment is found to be most effective in this stage of the disease and hastens the healing of wounds and sinuses. Heliotherapy is also of great aid in the healing of these wounds. When sinuses and open wounds are treated by *x*-ray the dressings should be simple. Hanford advises minute amounts of phenol in the sinuses with sterile petrolatum.

In the absence of *x*-ray treatment alternate dressings of balsam of Peru and the modified Durante's solution prove effective.

Sinuses of long standing which do not respond to such treatment need operation.

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BUNION & HALLUX VALGUS*

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THE subject of bunion and hallux valgus is presented with the aim of establishing the identity of each. It is believed that there are unquestioned evidences, as to type of pathology at the first metatarsophalangeal articulation, to be associated with each lesion. The cause of both conditions, as well as their nonoperative correction will be considered. Either term is commonly permitted to imply the separate or combined pathology of bunion and hallux valgus at this joint in almost any of its aspects. Albee[1] would consider the bunion and hallux valgus as synonymous and confined to abduction of the great toe.

To use these terms interchangeably for the mere pathological condition of enlargement and thickening of the bursa overlying the metatarsophalangeal artic-

[1] Albee. Orthopedic and Reconstruction Surgery. Phila., Saunders, 1919, p. 860.

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ulation is not correct. The word bunion is fittingly applied to such pathology, whether acute or chronic, but deformity confined to the great toe; however, Da-Costa[1] considers the possibility of bunion over the same joint of other toes. The

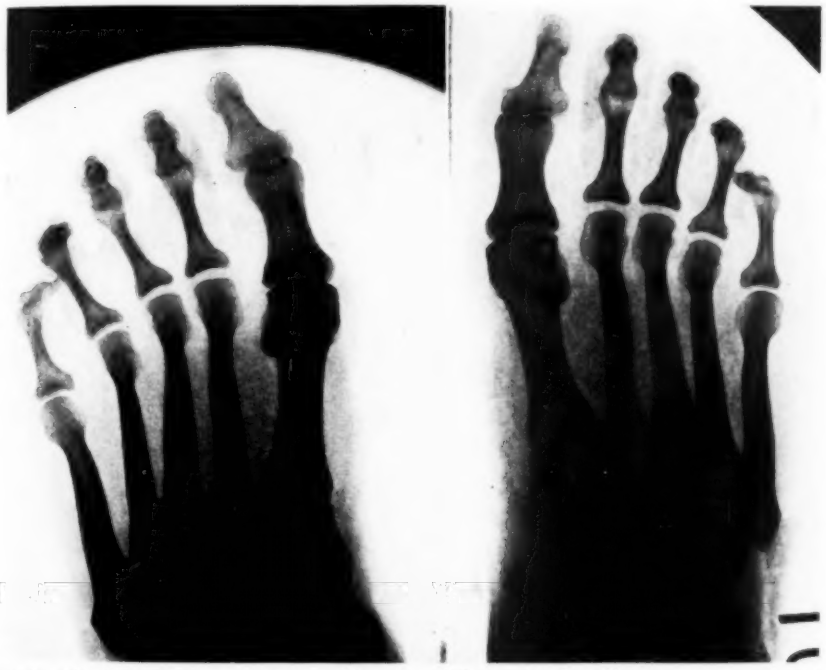

Fig. 1. Miss G. Manifesting acute symptoms of bunion (bilateral). Condition overcome by corrective shoes.

in the location should not be included. The term hallux valgus, however, when used, should specifically imply deformity, a deviation of the great toe from the medial line to abduction. Ordinary hallux valgus is deformity which is secondary to an initial process, the bunion. It is not believed that there is either a congenital or hereditary predisposition to the bunion *per se*, although there is authority contrary to this opinion.[1]

A bunion is a painful, acute or chronic inflammatory thickening or swelling of varying intensity of the synovial membrane and overlying soft structures at the first metatarsophalangeal articulation. Strictly speaking this lesion is primarily looked upon as a bursa, occasioned through continuous trauma from pressure and friction over the medial aspect of the metatarsophalangeal articulation of the great toe and without bony deformity. The disturbance, considered as such, is

[1] Moorhead. Traumatic Surgery, Phila., Saunders, 1917, p. 133.

practice among orthopedic surgeons is to apply this term to an indefinite pathology at the metatarsophalangeal articulation of the great toe.

The bunion, when of the acute type, presents the following symptoms, appearing in about this order: First, pain on pressure, sometimes with fluctuation over the joint involved and pain with great discomfort during efforts at use; second, swelling over the joint which may further be associated with contusion evidences such as redness, abrasions and ecchymosis; third, the possible finding of a nidus for the development of infection. The predisposition to breaking down of the soft structures, overlying the bursa of the articulation, through friction and pressure must be apparent. Thus, when these soft structures give way, and with the susceptibility of this site to infection as well as dissolution, the simple bunion may become a severely serious issue. Operation might

[1] Da Costa. Modern Surgery. Phila., Saunders, 1908, p. 653.

then be necessary even without any sign of valgus deformity.

Hallux valgus is an outward or abduction deformity of the first metatarsophalangeal articulation, of varying degree, the great predisposing factor being the bunion. The term hallux valgus implies abduction from the medial line or displacement of the great toe toward the other toes. It does not in any manner identify itself with what is understood by the term bunion. Hallux valgus as a deformity becomes an issue for correction according to its severity. The deformity itself, so long as it is not aggravated by an acute bunion, is often not of the painful type and as such may not require correction for the comfort of the patient. Frequently only because of the fact that one is unable to wear ordinary shoes with comfort, is operation considered. Where, however, severe symptoms are involved with this deformity, operation is the surest and best means for relief and correction. Hallux valgus of the moderate type may readily respond to corrective measures without operation through proper footwear and may possibly be further overcome with night splintage. Such measures can be facilitated by the patient who will practice proper foot manipulations and exercises.

Where the problem of severe deformity occurs, often involving dislocation of the proximal phalange of the great toe, with difficulty in ambulation, operation becomes the most certain method for correction. Hallux valgus can be so readily prevented by overcoming the predisposing factors of bunion that there is no excuse for the existence of the condition. The bunion may swing toward the development of a hallux deformity but correct shoeing with time will readily overcome the tendency. The general impairment of gait occasioned from these lesions is so simply corrected with proper footwear that it is disappointing to see how the wearing of improperly fitted shoes is permitted to continue. This factor alone leads ultimately to the ever-increasing pathological problems of the fore part of the foot.

The chief contributing factor to the development of the bunion is faulty footwear and the predisposing factor to the development of hallux valgus is the bunion. Short fitting hosiery will encourage and aggravate these conditions but the main or common cause is improper shoeing. Shoes which are too lightly constructed

FIG. 2. Mrs. S. Severe type of hallux valgus with contractures (bilateral).

for proper weight-bearing and walking predispose to trauma of the digits. Then, too, because of the short shoe with high heel worn by women or the short shoe with narrow toe worn by men in their efforts to make the foot appear stylishly shod, there is a general tendency toward crowding the foot into an undersized shoe. Wearing such shoes bunches together the toes so that there is more or less abduction of the great toe with overlapping or underlapping of the second toe. There are also not uncommonly varying degrees of injuries with resultant pathology to the crowded digits. The commonest developments from such factors are inflammatory changes, contractures, deformities and callosities. Of this group the callosity, the simple corn or clavus, whether of the hard or soft variety, is most heroically endured.

From the crowding of the foot into the short shoe with the high heel or the short shoe with the narrow toe, there ultimately develops a permanent deformity of the toes and, more particularly for our consideration, of the first toe at the metatarsophalangeal articulation. With continued wearing of a faultily constructed and short-fitted shoe the tendency to abduction of the great toe goes on uncorrected and without the needed consideration. At this particular stage correct shoeing may readily overcome deformity and it is almost certain it will relieve the acute inflammatory process of bunion since by the discontinuance of pressure the exciting cause is removed. One possessing such a lesion cannot wear a physiologically correct shoe of the same size as the stylish type to which he has been attached. Instead of recognizing the mistake and desiring that the foot be placed in proper alignment with a correctly built and fitted shoe, the subject will endure the discomforts and harm subsequent to wearing popular shoes of stylish type. The impossibility of holding the great toe in the medial line becomes a problem because of the fact that the inflamed and swollen bursa over the medial aspect of the "bunion joint" will be too acutely involved to permit a correction. Then too the toe cannot assume the proper

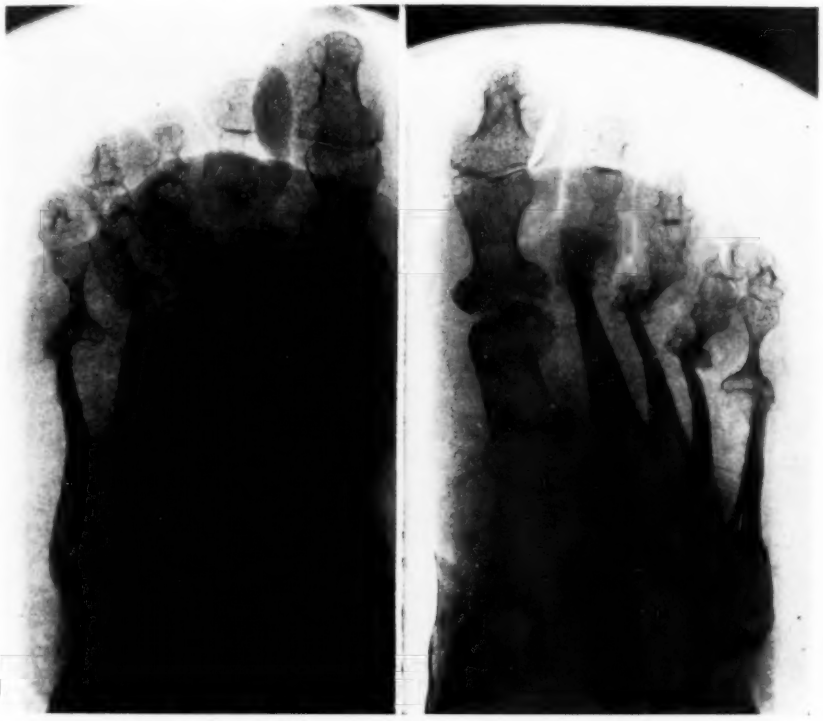

Fig. 3. Mrs. S. After correction by operative procedures.

alignment so long as the deformity is encouraged and maintained by the wearing of an improperly constructed and fitted shoe, from the viewpoint of anatomical structure. As this deformity continues, aided by support, inflammation of severe and deep character develops, and with further abduction of the great toe at the "bunion joint" the resultant deformity, hallux valgus, becomes a serious complication.

Thus, stimulation to bony formation through irritation about the distal metaphysis of the first metatarsal bone prevents any possible alignment with the former articulating proximal phalange. An apophysis or exostosis on the medial aspect of the joint is the result of this irritation and this spreading bony excrescence brings about in the extreme cases ultimate dislocation of the proximal phalange from the first metatarsal bone. It is this deviation outward from the medial line, whether of mild or severe character, which constitutes the lesion that should be identified by the term hallus valgus.

There is no reason for considering bunion and hallux valgus as one and the same lesion any more than there is for identifying bunion with hallux varus, hallux extensus, or hallux flexus.

In brief it is desired to stress the fact that with proper footwear it is readily possible to overcome the formation of bunion and the ultimate development of hallux valgus. Further that the bunion usually finds origin from the predisposing factors: short hosiery, short shoes with high heels or short shoes with narrow toes. Also, that the common sequel from a bunion left unattended is hallux valgus, which deformity may present advancing pathology, encouraged through the continued wearing of improper shoes. The ordinary bunion is readily corrected without operation while hallux valgus, as a complication or sequel, is a genuine deformity which cannot be overcome without operation, unless it be of the moderate type. About 90 per cent of all adults are sufferers from some sort of foot trouble most of which can be prevented by proper shoeing. People refuse to realize that most of this distressing list of disturbances originates from the wearing of improperly constructed and improperly fitted shoes.

WOUNDS OF THE SCALP AND FACE*

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ONE room in every office should be equipped for the care of emergencies; a supply of dressings, sterile instruments, and sterile threaded suture material, arranged on a small portable table ready for immediate use, is the minimum any doctor should offer his community.

The injured person must be placed supine on a comfortable table immediately upon arrival, regardless of the slightness of the injury. Repair of wounds and painful dressings must not be done with the patient sitting upright. Aromatic spirits of ammonia and whiskey are useful in avoiding an attack of syncope.

Cover the wound with a sterile dressing large enough to overlap the uninjured skin 1 to 2 cm. Make firm pressure with the fingers of the left hand to control bleeding. Wash the remainder of the face or scalp and hair free of blood with a wet towel; the wetter the towel the easier the blood is removed. Raise the sterile dressing, beginning at one angle of the wound, clamping bleeding vessels as they

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appear. Lift up the edges of wound and make a careful inspection of the depths, removing clots with smooth dressing forceps or by irrigating with saline, sterile water or weak peroxide solution. The author favors irrigating with weak peroxide solution because it makes foreign materials more easily identified and fracture line stand out clearly. Frequently the scalp has been stripped up for several centimeters, secreting various amounts of foreign material.

The mechanical cleansing of the wound is far more important than the liberal and blind use of antiseptic solutions. The relative merits of iodine, mercurochrome, aniline dyes, hypochlorite solution, ether, benzine, and picric acid as bactericides depend upon the care with which the wound has been mechanically cleansed and not upon their relative antiseptic qualities. The wound after inspection and removal of foreign material is flooded with any of the antiseptic solutions, iodine 3 to 7.5 per cent being the most frequently used. If any vessels continue to bleed, fine catgut ligatures are used, and if vessels have retracted and cannot be controlled with clamp, it may be necessary to use ligatures mounted on needles traversing the region of the vessels and tied just tight enough to control bleeding and not strangling all tissues in the grasp of the suture.

Now we are ready for suturing. Fine silk gut, black silk, horse hair, or Michel clips may be used. Michel clips are of very little use in the dense scalp but most useful in the frontal region and wounds of the upper face. If the wound is irregular, the angles are approximated first, the suture taking in the entire thickness of the skin. The deep fibrous layer is the layer that presents future spreading of the scar. One suture to 2.5 cm. is sufficient in the hairy scalp. In the face, sutures must approximate the skin accurately. It is a very sane procedure to drain all scalp wounds with small pieces of rubber band or twisted silkworm gut. Wounds of the face, if irregular or pocketed, should also be drained. All drains to be removed at the end of twenty-four to forty-eight hours if infection has not developed. An excellent dressing is compresses of equal parts of glycerine and alcohol. The compress is covered with oil silk, gutta-percha tissue, silkloid, or oil paper. Drainage is promoted and crusting impounding exudate is prevented. Wounds must be dressed daily until you are sure infection is not present.

An immunizing injection of tetanus antitoxin is given in all lacerated wounds where the subcutaneous tissues are invaded. The extent of the wounds is no indication of the likelihood of tetanus bacillus contamination. A small wound may harbor tetanus bacilli. Lacerated wounds ground full of street filth should not be sutured but drained and allowed to heal by granulation.

Hair washed with equal parts of ether and benzine is sterile and shaving need not be done in the scalp or eyebrows unless the hair interferes with approximation. One must always remember no matter how slight the scalp injury may have been and even though there is no apparent intracranial injury, that a fissure fracture of the skull across one of the meningeal arteries may exist and spell future disaster if not carefully watched.

Wounds of the scalp and face heal rapidly, and infection is not likely to occur, because of the abundant blood supply. In wounds of the cheek or lips entering the mouth, the sutures should include the skin muscles and submucous down to, but not including the mucous membrane. Approximate the mucous membrane with fine silk sutures. If the Stenson's duct is cut across suture the skin carefully, do not close the mucous membrane in the region of the duct, thus allowing a fistula to develop into the mouth and not externally on the cheek.

Too much foreign material, glass, splinters, metal, paint and enamel, is closed up in wounds of the scalp and face. Careful hemostasis, followed by careful inspection and mechanical cleansing is the only way to avoid this inexcusable error.

TREATMENT OF GRANULATING WOUNDS WITH DELAYED HEALING*

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THE stages of repair in a wound which heals by granulation tissue are as follows:

1. An abundant exudation of small round cells, whose function is to remove dead or damaged tissues, and also to break up, disintegrate, and finally absorb any blood clot.

2. The invasion of the wounded area by fibroblasts from the tissues composing the parts.

3. Vascularization by protaplasmic buds growing out from the capillaries. These soon become canalized and lined with endothelial cells. The capillary loops thus formed give the granular appearance to the developing tissue.

4. Cicatrization and epithelization: In this stage the fibroblasts become spindle-shaped with collagenous material around them. This gives to the wound contractile properties which tend to make the wound smaller and also lift the underlying tissues toward the surface, making the wound less in depth. This property of contraction also acts to constrict the vessels in the granulation tissue, causing, them to disappear. When the entire surface is covered with epithelium the wound may be considered as healed.

There are numerous conditions under which granulation tissue grows, which may alter the character of the granulations to such an extent that the wound will not heal. Some of the more common of these conditions are:

1. Lack of rest in the part affected. Rest is an essential factor in the treatment of granulating wounds, and if the tissues are constantly being stretched it is quite often impossible to heal them. For example, granulating areas over extensor and flexor surfaces of joints are most difficult to heal if the part is not immobilized.

2. Irritation by rough, unsuitable dressings, or irritating chemical agents which may be used in the dressing.

3. Unhealthy or devitalized condition of patient's tissues, as in badly bruised or lacerated skin, or in locations where there is persistent venous congestion, which prevents access of healthy blood. An example of the latter is well demonstrated by varicose ulcers.

4. Constitutional disease, such as Bright's disease, diabetes, syphilis, scurvy or alcoholism, severe anemia.

5. Infection.

6. Foreign bodies.

The treatment of wounds which will not heal due to the formation of granulation tissue is:

1. Constitutional: in which any severe constitutional disease is sought for and treated accordingly. In diabetes, for example, diet and the proper administration of insulin are used.

2. Local:

(a) Application of medicinal agents which may cut down excessive growth of granulations, or may stimulate inactive growth or clear up a low-grade infection.

(b) Surgical: Where a cicatrizing base of a granulating area is preventing it from healing, excision may be done and the freshened edges loosened and brought together, or skin grafting done as indicated. In cases of venous congestion due to varicose veins the latter may be excised, or treated by the injection method, i.e., injection of the veins.

First of all in granulating wounds which do not heal, constitutional diseases should be ruled out, but if found should be properly treated.

Next, one often encounters an exuberant overgrowth of normal pink granulations which have grown so far above the surface

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of the adjacent skin levels that it is impossible for epithelium to grow over the granulating bed. In these cases, repeated "burning down" to skin level by the application of silver nitrate caustic stick at intervals as indicated, will usually suffice to cause a rapid epithelialization of a wound. Not infrequently the granulating bed may present healthy granulations but be of such a diameter that it is quite impossible for the epithelium to push across the space In these cases pulling the edges of the wound into closer proximity by adhesive strips is often sufficient. Another very excellent use of adhesive in this type of wound is placing ¼ inch strips of sterile adhesive around the edges of the wound extending out into the granulating bed from the skin edge. In twenty-four hour's time the advance of epithelium under the strips can be recognized by the naked eye and by a continuation of the same process often very large granulating areas are covered over by new skin.

An example of excessive overgrowth of healthy granulations is well illustrated by a patient who had a scalp wound which would not heal, following a fracture of theskull. When I saw her several months later there was a mass of granulations tissue piled high so that it resembled a medium-size mulberry as to size and appearance. As it was clipped off with scissors a small sized artery was found extending up into it. Following the removal of this mound of granulation tissue, the healing-over process took place rapidly.

A chronic low grade infection may cause an exuberant growth of unhealthy granulation tissue. The granulations then take on a paler or grayish appearance which heap up and overhang the skin edges. There is usually a considerable whitish purulent discharge and the wound refuses to heal. This type of granulation is best treated by wet dressings until the infection is overcome, followed by use of the caustic stick, together with some mildly disinfecting and stimulating agent, such as balsam of Peru, dichloramine T. mercurochrome ointment, etc.

Foreign bodies in a wound, such as an unremoved suture, spicule of dead bone, a small piece of gauze or rubber drain, or in hand infections a piece of dead tendon, will cause an overgrowth of grayish, unhealthy appearing granulation tissue. Prompt healing follows removal of the foreign substance.

In contradistinction to exuberant granulations, there are the underdeveloped or insufficient granulations. Provided constitutional disease has been ruled out, this type of granulation tissue needs stimulating. Balsam of Peru is probably foremost among the non-irritating stimulants. There are numerous others, such as dichloramine T, Durante's solution, etc.

Physical agents are also useful. The simple therapeutic lamp consisting of a heat-giving bulb applied for fifteen minutes three times daily is most efficacious in promoting growth of sluggish granulations. Other light therapy such as the infra-red, or ultraviolet lights are useful but should be used with extreme caution and by an experienced person.

Heliotherapy, which is cheapest and most often accessible, is oftentimes completely forgotten. Subnormal granulation tissue when exposed to the direct rays of the sun is always benefited by the exposure, and healing is hastened. The patient can do this frequently at home between visits to the doctor. It must be impressed upon the patient, however, that the exposure should be direct and not through a window pane.

Constricting by voluminous dressings should be avoided, the aim should be to give as free an access of air to the granulating area as is compatible with good wound asepsis.

Under the class of deficient granulation tissue as a cause of wounds not healing, probably the foremost offender is the varicose vein ulcers in the lower extremities. Due to the constant venous congestion these ulcers at times will actually spread instead of healing. The most efficient non-operative method in this type of case is the application of the so called

ACE (all cotton elastic) bandage. This is applied in the morning before the patient gets out of bed, and is worn all day. Many of the smaller sized ulcers of this type will heal quickly under this treatment. Elastic stockings should never be used as they constrict at the top and the bottom, adding to the venous congestion rather than relieving it. They also can be extremely uncomfortable. For the larger, long-standing, more callous ulcers with cicatrized base, surgical removal of the veins is indicated, or better still, the injection method which is fast displacing the surgical procedure.

Wounds caused by chemical burns, severe bruises, etc., which cause a deep loss of tissue and heavy "scab" formation, are best treated by wet dressings of saline until the slough comes away.

Among the mildly stimulating ointments for this group of sluggish wounds is 5 per cent ammoniated mercury, boric acid and zinc oxide ointments.

In conclusion it may be said that wounds which will not heal, due to the formation of granulation tissue, fall into two great classes, the overgrowing granulations and the deficiently growing granulations. In the first group a cutting-down of the overgrowth or removal of the cause of this overgrowth is indicated. In the second great group the granulations must be stimulated and encouraged by the application of the physical and physiological principles indicated.

THE RÔLE OF LOCAL ANESTHESIA IN OFFICE PRACTICE*

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CONSIDERED from the standpoint of anesthesia alone, the office equipment of different physicians varies widely. Obviously what might apply to one would have no application to others. Few physicians realize the ease with which any office may be equipped with the necessary paraphernalia required for the routine employment of local anesthesia. Once the equipment is installed and the fundamentals of technic mastered, the bugaboo that the use of local anesthesia is a complicated process fades into obscurity. Furthermore, when the physician has his office so equipped and realizes the advantages that may accrue from the routine use of local anesthesia in office practice, he will be surprised at its many advantages and, as a rule, wonder how he formerly carried on without this important adjunct.

Regardless of the type of work a physician does, general practice or specialization, rural or urban, there is one fundamental principle that should always be his guide. The interests of the patient should transcend all others. Even the application of the slogan "the greatest good to the greatest number" must never be allowed to interfere with the application of this principle. Every individual patient should receive the benefits to be derived from following this maxim. Time, expedience, decreased income, the physician's comfort and every conceivable factor must be considered secondary in importance to the patient's interests.

Advantages. With the above considerations in mind there are many advantages to be gained by the employment of local anesthesia whenever it is indicated. Incidentally, its use corresponds in a marked degree with the patient's interests, expediency and many other important points.

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From the patient's point of view, there is usually a great difference between a visit to the hospital and the office. In the absence of an emergency this difference is often sufficient to cause the patient to delay or avoid treatment rather than go to the hospital. It is my experience that many patients who will not consider entering the hospital will consent to a minor operation in the office. Thus, the fact that the physician is prepared to perform minor surgical procedures at the office will, in many instances, bring elective minor surgical cases to operative treatment which otherwise might not come at all. The association of the hospital in the minds of the laity with confinement to bed and expense contrasts markedly with a trip to the physician's office and an ambulatory convalescence.

Again, there is a large borderline class of cases which, depending upon the choice of the physician, may receive treatment at either hospital or office. Most people, however, prefer the latter. The advantage of local anesthesia may manifest itself in another way. Those with known surgical conditions, as minor skin or rectal lesions, may present *earlier*, provided they believe that they can be treated at the office. Indeed some of these, if confronted with a trip to the hospital as the only alternative will refuse succor. Nor infrequently those who, for the reasons mentioned, go to the office, may be prevailed upon to go to the hospital for an operation should it be deemed necessary, whereas had they not expected that they could be treated at the office, they might not have presented at all.

Another advantage of the constant and proper use of local anesthesia in office practice is its aid in making painless examinations, or instrumentations, especially those associated with the bladder or urethra. In regard to this point, it has been my observation that few physicians would think of inflicting upon a patient an examination, or any kind of instrumentation, that would result in loss of consciousness, but even in this epoch, some physicians still insist upon passing urethral sounds in the male without first anesthetizing the urethra, with the result that an occasional patient faints on account of the pain. The pathological rectum or anus, when acutely inflamed, is likewise all too often examined without anesthesia, the patient being caused needless torture. It is obvious that the more attention there is paid to the use of local anesthesia in office practice, the less will be the suffering of the sick and the more incentive there will be for patients to attend to their ailments.

Equipment. The equipment required for employing local anesthesia in office practice is simple and yet, if the physician expects to meet the indications and he and his patients are to derive the full benefits of the method, careful thought must be given to the armamentarium.

Off-hand, one might think that a syringe, some needles and an anesthetic solution are all that are required in order to employ local enesthesia in office practice. As a matter of fact, these essentials are but a portion of the necessary equipment and the choice, preparation and care of these is exceedingly important. Provided one wishes to obtain the maximum advantage of local anesthesia, attention must be given to the adjuncts its use demands at the office as well as the hospital.

The psychic aspect of the subject must not be overlooked and while preliminary hypodermic medication is seldom indicated or advisable in office practice, everything possible should be done before and during the examination or operation, to allay the patient's apprehension and insure comfort and confidence.

A most important dictum is that no patient should be given novocaine by injection while in the upright position, provided the drug can be administered with the patient reclining. Also if the drug is injected with the patient in the upright position, facilities should be at hand to allow the assumption of the prone position without the slightest delay. So-called

idiosyncrasies to novocaine, while extremely rare, probably do exist and as patients not infrequently faint from other causes, which produce cerebral anemia, the treatment of both conditions demands the prone or inverted position.

In our experience, ether is the most satisfactory antidote to novocaine. Caffeine is recommended but the few slight reactions we have seen subsided before this drug could be administered. It is our opinion that ether should be at hand and administered at once in case a patient shows a serious reaction. Caffeine, when used, should be given intravenously and in a large dose: 7 grains. These drugs are as much a part of the necessary equipment as are syringes and should be in readiness before the local anesthetic is administered. Slight reactions require only the head-down positions for a few moments. It is probable that the majority of these reactions are due to cerebral anemia and have no relation to the toxicity of novocaine. A few inhalations of ether are stimulating in any case and do no harm.

Sterilization. The sterilizing basin should be square and may be used as an instrument tray during the operation. At least two good syringes, preferably of different sizes, (5 and 10 c.c.), should be prepared by boiling in distilled water. A number of needles, in sizes corresponding to the demands of the case in hand, should be sterilized with the syringes. Two small containers of glass or metal and graduated in cubic centimeters should also be sterilized. The drugs required may be sterilized with the syringes and instruments, being placed in one of the containers which is partially filled with water. Corresponding to the amount of solution required, a number of Ringer's tablets are dropped into the solution before boiling. With one of the syringes a sufficient amount of water may be added after sterilization to bring the solution to the proper level. Epinephrine tablets, if used, may be added before sterilization, but if adrenalin chloride is used it should be added to the solution *after* sterilization by means of a sterile medicine dropper. This procedure may be considered safe as repeated bacteriological tests have been found negative. A more simple method is to keep on hand a "stock solution" of novocaine in Ringer's solution (2 to 4 per cent) in a sterile bottle and dilute it as desired. Such solution may be kept from four to six weeks, and probably much longer, without deteriorating although it may take on a light brownish color. Solutions that are dark brown should not be employed. Careful cleaning of the syringes and needles after using is important. The needles should be flushed with alcohol or ether, then with air and the lumen coated with a thin oil.

Quinin and urea hydrochloride in a strength of 1:600 should be used in all granulating wounds as a prophylactic against pain. Its preparation is similar to that of novocaine.

Anesthesin should be employed preliminary to all throat operations, one tablet being dissolved in the mouth thirty, twenty and ten minutes before operation. A novocaine suppository (4 per cent) should be inserted in the rectum one-half hour before making a proctoscopic examination. In case the necessity of an operation is apparent, the rectal examination should be postponed until after anesthesia has been established by a sacral block or by infiltration. By following this plan much suffering may be avoided.

Brachial anesthesia may be employed at the office and under its influence emergency or elective operations upon the upper extremity may be performed. Even dislocations of the shoulder and elbow may be reduced under this type of anesthesia.

For the passage of a catheter or sound the instillation of 4 per cent novocaine solution, to be retained for a period of fifteen to twenty minutes, is satisfactory except in the case of complicated strictures, which are best treated at the hospital and under sacral anesthesia.

Cystoscopic examinations may be made routinely at the office but this requires

special equipment, *x*-rays, etc. and should not be attempted in the absence of complete equipment. Furthermore except in "repeaters," sacral anesthesia is the method of choice for cystoscopy and few offices are properly equipped for the induction of this type of anesthesia. Therefore, unless the equipment is adequate and a well-trained corps of assistants available, sacral anesthesia should be reserved exclusively for hospital practice.

All types of minor surgery may be performed at the office under local anesthesia. The difficulty of maintaining asepsis is a more important reason for sending patients to the hospital than is the difficulty of administering satisfactory local anesthesia.

In an office equipped with *x*-rays, fractures, with the possible exception of those of the lower extremity, may be reduced under local anesthesia. In the upper extremity brachial anesthesia, conduction anesthesia, or a transverse infiltration block are entirely satisfactory and the patient may become ambulatory in about two hours. In such cases, anesthesia may be established, the physician may go on with his other work for fifteen or twenty minutes, while the anesthetic solution is disseminating, and then reduce the fracture. A qualified nurse should be in charge of the patient the while. Anesthesia will endure sufficiently long to permit the repeated making of roentgenograms.

The properly equipped office therefore compares favorably with the hospital for this type of work, whereas, with general anesthesia this is not true. Among the other conditions that can be treated under local anesthesia are: Many varieties of lacerated wounds, skin tumors, the removal of foreign bodies such as needles from the tissues, the removal of foreign bodies from the eye, the injection of the sciatic nerve with quinine and urea (in these cases the patient may ride home and remain quiet for a day or two).

The physician who handles a considerable amount of industrial surgery will find it well worth-while so to equip his office that a wide variety of wounds, muscle and tendon suture, amputations and plastics about the hands may be done under local anesthesia. I may say that we have carried out all of these procedures at the office under local anesthesia but, I repeat, careful preparation for all anesthetic emergencies was made. Therefore, as stated, he who essays to do this type of work must make adequate preparation for it. The outlay is not great but everything should be in readiness to meet the requirements. Once a system is established, it soon becomes routine and the physician who prepares his office for this routine will be surprised at the scope to which local anesthesia can be employed in office practice and likewise astonished at the satisfaction that will be experienced, not only by him but his patients as well.

The anesthesia technic in office practice differs in no wise from that used in hospital practice. The same attention to *finesse* is required in both. Borderline cases, when it is practicable, should be sent to the hospital.

Regardless of what may be the relative merits of local and general anesthesia in hospital practice, local possesses many advantages over general as an office anesthetic. Thus the general practitioner, who may be situated far from hospital facilities and a good anesthetist, may increase his usefulness and the scope of his activities, by familiarizing himself with local anesthesia technic and equipping his office for its employment. Likewise the surgeon or surgical specialist may offer to his patients many of the advantages mentioned above and if fortified with an assistant, an office nurse and *x*-rays, may perform cystoscopies, tonsillectomies, reduce fractures, treat surgical lesions of the skin and rectum and a variety of industrial injuries.

SUMMARY

The scope of local anesthesia in office practice may be made comparatively broad. Its use has advantages that are both economic and psychic. It is of special

advantage to the isolated practitioner of medicine who lacks hospital facilities. Its use demands special training and equipment and no one who is not prepared to employ it skilfully should essay its use. With proper training and equipment local anesthesia may be employed in office practice with a great deal of satisfaction to the physician, surgical specialist and their clientele.

THE PREVENTION OF CICATRICIAL CONTRACTIONS*

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THE degree and extent of cicatrix formations depend upon a number of known factors and an unknown number of less apparent ones. Thus, in a consideration of cutaneous burns, the surface area involved and the depth of the tissue injury will govern the *extent* of the subsequent scarring. Wound infection plays an important part in repair processes and influences to a large extent the *degree* of scar tissue formation. Clean wounds heal with minimum scarring. The converse is likewise true. In addition, clinical experience indicates that certain microorganisms produce more tissue destruction than others, thus influencing the extent of the subsequent cicatrix. The anerobic bacteria are peculiarly the offenders in this respect.

Less apparent factors must surely be operative in determining the degree and extent of scar tissue formations. It is difficult to explain why some patients produce large scars with cicatricial contraction resulting in deformities, while others, with practically the same wounds, will show little tendency to scarring and no indication of deformity. The reasons for this marked difference in individual response are not known, but will probably be found in the future through further studies in tissue physiology and tissue chemistry. From a preventive standpoint, likewise, little is known which would aid in forestalling the development of extensive cicatrices in patients who, from previous experiences, are known to be susceptible to this tendency.

The anatomical site of the original wound or injury governs the development of a cicatrix which will contract so as to produce deformity or interference with function. Extensive wounds, especially burns, involving the neck, lips, angles of the mouth, eyelids, the axillary folds, the popliteal regions, the antecubital fossae and the fingers, will very often result in serious deformities, unless measures are taken to prevent such sequelae. Even then the outcome may not be a happy one. In considering the healing response of the various regions of the body enumerated, certain axioms, more or less true, may be enumerated. Second and third degree burns involving the eyelids will produce cicatricial contractions resulting usually in ectropion of one or both eyelids. Extensive injuries or burns about the mouth and lips will often cause bizarre cicatrices changing the entire facial expression, interfering with the functions of the lips or producing ectropion of the lips. In the latter condition, the constant drooling of saliva is a particularly distressing complication. Deep burns of the neck during the process of cicatrization produce a very disfiguring deformity whereby the chin is drawn down toward the chest and extension and rotary movements of the head are greatly impaired. Burns involving the

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axillary folds form cicatrices which bind the arm to the side of the chest and prevent abduction at the shoulder, a serious functional disability. The flexor surfaces of the various joints of the extremities are especially vulnerable from the standpoint of cicatricial contractions and the subsequent development of flexion contractures.

In considering the prevention of cicatricial contractions, the surgeon must consider the effect on form and function of the wound he is about to make with his scalpel. This is especially important in the surgery of the face, neck, axillae and extremities. The surgeon should be familiar with the anatomy of the "lines of the skin." These "lines" indicate where skin tension is greatest, where relaxation occurs, where natural cutaneous wrinkling is situated and serve as a guide to the proper placing of incisions, their direction and extent, with a view to producing minimum subsequent scarring. For instance, a median vertical incision in the neck should rarely be made. The tendency toward a flexion contracture is considerable. Again, one should never make an incision at right angles to the flexion creases of the joints of the extremities, especially of the fingers. This might very well be considered one of the ten commandments of surgery. An incision made over the front of a finger so as to cross the flexion creases at right angles will nearly always produce a flexion contracture. The proper site for a finger incision is on the anterolateral aspect. For greater exposure of the deeper structures, it may have a right-angled extension running parallel with a flexion crease.

In dealing with injuries and wounds of the regions of the body already enumerated, the surgeon must constantly bear in mind what effect the subsequent scarring will have on form, and especially, function. In wounds of the extremities, measures must be taken to prevent contractures of the flexor surface of joints. The judicious use of splints or of the principle of traction and suspension during the process of healing ranks foremost. Thus, a knee should be kept in extension during the healing of a burn in the popliteal space. The head should be kept in extension during the convalescence following a burn of the neck. Burns or wounds with loss of skin involving the axillae call for wide, full abduction at the shoulder until healing is complete. The surgeon should be particularly solicitous of wounds of the flexor surfaces of the fingers because of the ease and rapidity of the development of contractures. Intermittent splintage in extension is the method of choice. I say "intermittent" advisedly, because finger joints become stiffened easily with continued immobilization. Or, one may make use of the principle of elastic traction by the employment of a banjo splint with rubberband traction of each finger. This permits of continuous extension.

Often the surgeon is confronted with a large granulating wound, following a burn, for instance, which presents a constantly weeping surface and which promises a prolonged convalescence. During the process of epithelialization of such a wound by the growth of epithelium from the sides, considerable fibrosis of the underlying tissues takes place and the chances for cicatricial contraction are greatly enhanced. The early application of Thiersch grafts to such a wound as soon as the appearance and bacteriology of the granulations permit, brings about early healing and, what is more important, a minimum of the underlying fibrosis. Very often, indeed, with the parts placed in overcorrected positions, no contraction of the scar will occur. Should contraction develop, however, the procedure has accomplished a considerably shortened convalescence with rapid healing. The more general adoption of this procedure emphasized by H. H. M. Lyle, is recommended as one of the important aids in the prevention of cicatricial contractions. The subsequent application of pedicled skin flaps or the performance of various plastic operations must be considered for the relief of scar contractions, should they occur.

OFFICE TECHNIC OF CERVICAL BIOPSY*

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THE early diagnosis of malignant neoplasms is the most important item at the present time, and nowhere is this necessity greater than in the cervix uteri. When one considers that over 50 per cent mortality still persists with the most modern therapeutic measures used, and that carcinoma of the cervix is the most common of all malignant tumors in women, there appears only one way to combat this deplorable situation, and that is by recognition of the process in the early stages, depending not only on our diagnostic acumen, but also looking to the microscope for aid. This necessitates doing more frequent biopsy studies of suspicious lesions.

Erosions of the cervix are by no means as innocent and unimportant as they look, for they not only frequently serve as a starting point for a carcinoma, but may also present, to all intensive purposes, a benign-looking lesion behind which an early carcinoma is gaining a fatal headway. So too, the small pedunculated polyp, protruding through the external os of the cervix, may be and not infrequently is the seat of an early myosarcomata of the cervix.

Bearing these two possibilities in mind when examination of the cervix presents such a condition, this examination is not complete until a biopsy has been done, and this simple procedure can be safely and aseptically done in the office.

The procedure is as follows: With the patient in the knee-chest position and using a Sim's vaginal speculum which elicits the best exposure of the cervix, though good exposure can be obtained with the patient in the lithotomy position, and a bivalve speculum in place, the vagina and cervix are gently swabbed with cotton until dry; the cervix and upper third of the vagina are painted with 3½ per cent tincture of iodine. Into the cervical polyp, or into the suspicious zone of cervix a single hook tenaculum is inserted to steady the cervix or polyp and afford the operator a point of leverage. In the case of a polyp it is advisable to be very gentle in the traction so as not to tear the polyp off its attachment because of the danger of hemorrhage, but to use a moderate amount of tension and then with a cautery tip at a cherry-red heat slowly transect the pedicle until the polyp has been severed. The heat from the cautery safeguards against hemorrhage by coagulating the blood vessels cut across.

In the case of the cervical lesion, into which a tenaculum has been inserted, using a sharp knife, a small wedge of tissue is removed about 1 cm. on each side. Then gently sponge the bleeding surfaces dry and cauterize the raw areas with the cautery tip at a cherry-red heat until all bleeding has ceased. Following both procedures a tampon soaked with 4 per cent mercurochrome is placed flush against the cervix. The tampon is left in situ for at least twelve hours, serving two purposes, i.e. as an antiseptic, and to aid in hemostasis if the cauterization has been inadequate.

The specimen should be immediately placed in a test tube containing 10 per cent formalin and dispensed to a competent pathologist for microscopic study.

In conclusion one must remember that:

1. Gentleness with tissues suspected of being malignant cannot be too strongly emphasized, for trauma in any form favors metastases.
2. All instruments must be sterile.
3. The knife must be both thin and sharp to minimize the trauma.
4. The cautery at a cherry-red heat is used to seal off all lymphatic and blood

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vessels which are cut across, thus preventing metastases and also eliminating the possibility of an open, free wound from becoming infected; for infection runs hand in hand with trauma in the spread of this disease.

THE BUBO*

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CONTRARY to general belief that a bubo is an inflammatory reaction of the inguinal glands, any lymphatic gland which is undergoing inflammatory changes is a bubo. The etiology of the inflammatory reactions is, of course, multitudinous and presents a most difficult and at times, baffling diagnostic problem. It is not so much a question of the treatment of the lesion, which we will soon consider at greater length, as it is of differential diagnosis. At times the diagnosis can not be made and the lesion is consigned to the waste-basket or "granulomas."

A patient comes to the office complaining of a "lump" in the groin. It is hard, firm, and painless or it is red, inflamed, painful and tender. Or the enlarged gland may be found during the course of the physical examination, apparently symptomless. Another patient comes in presenting a ragged ulcerating lesion in the groin, perhaps painful usually necrotic, secondarily infected, and discharging purulent material. Effective treatment can be instituted only after a diagnosis is made.

The buboes resulting from tropical sore, bubonic plague, oriental plague, actinomycosis, glanders etc. are so rare that they need not be discussed in a paper of this nature. The common garden variety of bubo claims our attention first and perhaps the most common of all is the bubo consequent on gonorrheal or chancroidal infection.

The swelling of the inguinal glands during the course of gonorrheal infection may come on shortly after the onset of infection or some years afterward. Usually a focus of infection still remains in the seminal vesicles, prostate or epididymis which feeds the infective material into the lymphatics. The first appearance of the bubo is heralded by a small somewhat tender swelling in the inguinal region. The swelling increases in size, the pain becomes more intense and the skin over the glands is tense, red, edematous and excruciatingly tender. The glands are very hard at first but after a time necrosis begins and suppuration which is frequently followed by rupture through the skin ensues. Thick, creamy, greenish pus is found on incision of the mass. After the glands have softened the pain is relieved and incision and drainage is soon followed by rapid granulation. The gonococcus is not found in the tissue and the inflammation, in the majority of cases, is due to absorption of toxins rather than the presence of the specific organism. Usually the patient has an acute gonorrhea when he presents himself and the diagnosis is self-evident but a careful rectal examination should always be made to rule out the prostate and seminal vesicles as possible foci of infection.

The treatment is the essence of simplicity: The patient is put at rest and heat, is applied in the form of hot wet dressings, hot baths and hot-water bottles. If absorption is going to take place the heat will hurry it along and if the glands are going to suppurate the heat will localize the pus. If the glands become soft and fluctu-

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ant with this treatment, incise and drain, do not wait for rupture.

The so-called "iodine compress" is very useful in the early stages of a bubo, and will either abort its progress or hasten it on to resolution. The iodine compress is as follows: Paint the affected area with tincture of iodine, place over this a gauze pad saturated with glycerine, then cover this with a piece of oil silk or gutta percha and hold in place by a spica bandage. This compress can be changed daily.

Perhaps the next most common bubo is the satelite bubo of chancre. The inguinal glands in syphilis appear shortly after the appearance of the chancre. The glands insinuate themselves in a slow painless fashion and become enlarged and firm. Contrary to general opinion the glands are quite tender and painful when they have attained a moderately large size.

The presence of the chancre, the history of exposure, the Wassermann reaction, the clinical appearance of the gential lesion and the demonstration of the spirochetes in the penile sore make the diagnosis. The microorganism may also be found in the bubo in many cases with proper staining and occasionally can be found on dark-field examination of material aspirated from the swollen gland. Only rarely do the buboes rupture through the skin, and with the institution of proper antiluetic treatment they soon subside and melt away: The gumma of tertiary syphilis is also a common offender. This lesion will frequently rupture through the skin and present a sloughing, necrotic cavity which heals slowly if at all. The dark-field is usually negative but the history and the Wassermann reaction should help in making the diagnosis.

The chancroid or soft chancre, as it is frequently called, is most common among the negroes. The primary sore is usually on the penis. This appears in twenty-four to fourty-eight hours after exposure and is caused by the streptobacillus described by Ducrey. The ulcerations are ragged and undermined and the floor of the ulcer is usually covered with necrotic material which soon becomes secondarily infected. Almost always the inguinal lymph glands are involved. They become greatly swollen and tender and occasionally they rupture through the skin but more often incision reveals a quantity of thin purulent material. The glands are matted together and the process advances through the lymphatics to the whole chain. Pain is the outstanding symptom and appears early, becoming progressively worse. Healing takes place with extensive scar formation. The disease is autoinoculative and this serves as an aid in the differential diagnosis. If a small area of healthy skin on the thigh is vaccinated with a little of the material from the lesion, the appearance of a pustule in twenty-four to fourty-eight hours indicates that the original lesion is a chancroid.

Treatment consists in wide incision and drainage of all infected and suppurating areas, hot wet dressings of boric acid or bichloride of mercury 1:10,000, hot baths, and the application of copper sulphate or Rosenwald's solution two or there times a day (Copper sulphate and Rosenwald's solution must be applied topically and not in the form of a wet dressing). Convalescence is usually long and tedious. Often gonorrhea and chancre are complicating factors. If this be true treatment for these conditions should be started immediately. A severe balanoposthitis or a phimosis may require dorsal slit or bilateral slit.

Granuloma inguinale is not primarily a lesion of the lymph nodes. The disease usually manifests itself first on the penis or scrotum and later the lesion may appear in the groin. The glands are not involved unless secondary infection supersedes. Diagnosis is made by inspection and microscopic examination of a bit of the tissue from the base of the ulcer. Treatment with tartar emetic gives the best results.

Tuberculosis of the inguinal nodes is not a common finding but occasionally it is seen, usually associated with turberculosis elsewhere in the body. The glands may be

enormously enlarged and present the characteristics of an ordinary intense inflammatory process. They may rupture through the skin and form chronic draining sinuses. Except in the early stages of congestion and inflammation there is very little pain although they may be tender. During the acute stage the pain may be excruciating.

Sunshine, ultraviolet light, and the usual hygienic treatment of any tuberculous lesion should be instituted. The condition may run a very protracted course and occasionally total excision is attempted with variable results.

All too often the simpler affections of the gential regions produce an inguinal adenitis whose underlying cause may be overlooked. Pediculosis pubis frequently produces a bubo and so also may the various non-specific infections of the penis and scrotum. This should always be kept in mind and treatment of the underlying cause be instituted. Lesions on the toes, feet and leg have also produced buboes.

As a final thought we must remember that the enlarged inguinal glands may be only a part of a systemic disease and that they may be affected in Hodgkin's disease, primary and secondary malignancies, and in the various forms of so-called blood diseases.

MINOR SURGERY OF THE ANORECTAL REGION*

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WHILE it is desirable in most cases requiring any type of surgery to have the patient in a well-equipped hospital and made to rest after the operation, there are many anorectal conditions which can be surgically treated, if necessary, in office practice and the patient not be confined to bed.

Practically every case of anal fissure, hypertrophic papillitis, anal cryptitis, single polyp, external thrombotic hemorrhoids and prolapsing internal hemorrhoids of moderate size, as well as simple direct anal fistulae and small abscesses may be treated in office practice with a large degree of success.

In a few patients, even in this day of a wider dissemination of medical and surgical knowledge among the laity, there still exists an antipathy against the hospital and an inordinate fear of surgical operations and general anesthesia.

There is a class of patients which would unquestionably fall into the hands of the irregular, the charlatan and the unethical fellow who guarantees cures, if the regular profession did not have some non-confining method of treatment which would successfully relieve the patient of many anorectal pathologic conditions without hospitalization.

It is not my purpose to discuss the treatment of all of the diseases which could be so treated nor the various methods of treatment for any single disease in a brief article of this type. Only methods which have been successful in my hands for the treatment of such anorectal conditions as can be safely treated by the average physician in office practice will be discussed.

HEMORRHOIDS, ACUTE, THROMBOTIC

Most patients suffering from thrombotic hemorrhoids, single or multiple, can be treated in office practice. With the patient in the left lateral position on the operating table a bluish or purplish mass is noted at the anal margin. Its skin covering is stretched as a rule and the patient has usually irritated it by attempting to push it into the rectum, where it did not belong.

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After cleansing the part with alcohol and painting it with 4 per cent mercurochrome solution, the tissues underneath, above and surrounding each hemorrhoidal mass are injected with a ½ per cent novocaine or apothesine solution. The external hemorrhoid is then grasped with a forcep and through an eliptical wound the clot or clots evacuated. Rarely is there any arterial bleeding. If so, the spurter should be ligated with fine catgut. Some anesthesine powder is applied to the wound and a pressure gauze pad firmly strapped in place with adhesive plaster. The patient should rest three or four minutes in a recumbent position after the dressing is applied and then may go home to rest the balance of the day. He reports daily to the office for dressings until healed. He is instructed to take an ounce of mineral oil every night to prevent the formation of hard stools.

HEMORRHOIDS, INTERNAL, CHRONIC, PROLAPSING

In most cases internal hemorrhoids should be removed at one time when the patient can be confined to a hospital for at least two or three days. In office practice, however, internal hemorrhoids can be removed under infiltration anesthesia, one at a time and the patient need not lose any time from his vocation.

He is asked to report to the office after having had the bowel thoroughly cleansed by the administration of a soda bicarbonate enema the preceding night followed by another in the morning. One-half hour before his appointment for operation a grain of codeine is administered by mouth. He is put in the left lateral position and the skin surface prepared as already discussed. The anesthesia of choice is a 0.5 per cent solution of novocaine or apothesine for the preliminary injection and a 0.5 per cent solution of quinine-urea hydrochloride for postoperative anesthesia. A 20 c.c. glass syringe armed with a 2 inch 20 gauge needle is filled with the solution of choice. The skin is punctured ½ inch behind the posterior commissure and a few drops of the anesthetic solution are immediately injected. Several cubic centimeters of the solution are then injected in a U-shaped direction on both sides of the anal canal, until the entire circumanal skin has been infiltrated from one puncture. Two or 3 c.c. are injected deep into the sphincter muscle in the posterior commissure and the needle withdrawn. Next the entire area surrounding the anus 1 inch from the external sphincter muscle is infiltrated with a 0.5 per cent solution of quinine-urea solution and five minutes allowed to elapse. At the end of this period the sphincter should be completely relaxed and the hemorrhoids prolapsed. Inasmuch as in practically all cases there are three hemorrhoidal groups present, namely: left lateral, right anterior and right posterior groups, each group must be removed at a different time. The interval is usually one week.

HEMORRHOIDS, EXTERNAL, CUTANEOUS

These consist of tags or pouches of thickened skin occasionally containing varicose veins. They usually bear a definite relation to internal hemorrhoidal tumors and really are not true hemorrhoids at all. Inasmuch as they are annoying to the patients, interfering with the proper toilet of the parts, they are often sources of annoyance and complaint. In office practice these should be removed singly. After the skin is cleansed and sterilized the selected tag should be distended with a 0.5 per cent novocaine solution and under its base a few drops of 0.5 per cent quinine-urea solution should be injected. The hemorrhoidal tag or fold should be excised level with the surrounding skin and always radial to the anal opening. The outer extremity of the wound should never be cupped or rounded, but should always taper to a point. This allows the wound edges to come together accurately and stitches are rarely necessary. Spurting vessels should be tied with small sized catgut but venous oozing is controlled

by a compression bandage. If these cutaneous tags are small it is not necessary to confine oneself to the removal of a single one. If there is no occasion for haste, it is better to remove them singly in office practice.

FISSURE AND ULCER

A fissure is a crack usually extending through the transitional membrane lining the anal canal down into the skin. If it has existed for several days the outer or skin extremity is often thrown into a thickened cresentic fold or tab designated as a sentinel pile. Fissures usually become ulcerated and are inclined to chronicity. They may occur anywhere in the anal circumference, but many are found in the posterior quadrant. They are traumatic in origin and most often result from tearing down of a posterior crypt by sneezing, coughing, straining or the passage of hard or irritating stools. They may be produced by faulty instrumentation. The sharp stinging or cutting, throbbing, spasmodic and often agonizing pain is out of all proportion to the size of the lesion and the patient demands prompt and lasting relief.

In order to overcome this sphincter spasm, the sphincter must be put to rest. Formerly it was deemed necessary to always divulse the sphincter to accomplish this. We now know that divulsion suspends sphincteric activity by forcible overstretching, tearing the sphincter fibers and ofttimes injuring the sphincteric nerves. We now know that sphincteric rest is best accomplished by putting at rest only the area of sphincter fibers involved at the site of the lesion. Occasionally sphincteric rest of a fresh fissure can be accomplished by the injection of a 1 c.c. of 2 per cent quinine-urea solution directly underneath it. After the skin is prepared a point ¼ inch outside of the external extremity of the fissure is punctured and the entire fissure raised in a wheal produced by the injection of the quinine-urea solution. A temporary fibrous splint is produced by the action of the quinine-urea solution in the tissues and this arc of the sphincteric circumference is given temporary physiologic rest. If a sentinel pile is present it is excised at the same time and in the same manner as already described. If the injection of quinine-urea solution does not give the patient more than temporary relief, the fissure should be incised. The sphincter should be anesthetized according to the technic already described and quinine-urea solution injected in the same manner, but the infiltration should completely surround the area involved. An incision should be made through the base of the fissure and through approximately one-fourth of the thickness of the sphincter. This incision will put these sphincter fibers at rest during the healing process. The skin edges should be incised so that there will be no overhang remaining and a trench-like wound is produced. The external part of the incision should be brought out on to the skin for at least ½ inch. Spurting vessels should be tied and a piece of rubber tissue inserted in the wound to remain for a few hours and a compression dressing applied.

PAPILLITIS AND CRYPTITIS

Annoying and often painful symptoms are caused by hypertrophied anal papillae as well as by ulceration, and infection of the anal crypts. Anal cryptitis is a very fertile source of focal infective symptoms and should always be reckoned with in every case where a focus of infection is sought.

Hypertrophic papillitis is easily recognized on digital examination. The papillae are enlarged, thickened and usually very pale in color. Often a tear at the base of a hypertrophied papilla gives rise to sphincter spasm and other symptoms usually associated with fissure or ulcer. Infected or ulcerated crypts are found at the base of or between hypertrophied papillae. They are usually sensitive to touch and through the anoscope look angry red in

color. Often pus is expressed from the mouths of the infected crypts.

Cryptitis and papillitis usually cause anal spasm. While this condition is usually associated with internal hemorrhoids, in many cases no hemorrhoids are present. The removal of papillae and draining of crypts is easily accomplished under local anesthesia. The canal is anesthetized in the same manner as has been described for the removal of internal hemorrhoids.

Each hypertrophied papilla in a given quadrant is grasped with a fine pointed hemostat and excised from without inward with fine curved sharp-pointed scissors. If a spurting vessel is encountered it is tied with No. 0 catgut. Sometimes hypertrophied papillae may by removed with a snare or excised and touched with the galvano-cautery. All diseased crypts should be made prominent by traction with a hook-shaped tractor and excised or incised as the individual crypt demands. Any overhanging edges should be trimmed away. The insertion of a small anal tampon covered with some anesthetic and germicidal ointment is of great assistance in making the patient comfortable after the operation. This is allowed to remain until after the patient's next bowel movement.

SIMPLE, DIRECT FISTULA AND SINUS

As a general rule all fistulae are best treated in the hospital. If, however, careful study by the injection of bismuth paste and stereoscopic radiography demonstrates the fistula to be of the simple direct shallow type and not undermining the sphincter it may be excised under infiltration anesthesia in the office.

A fistula not over 1½ inches in length and not involving the sphincter muscles may be excised in the following manner: The parts are well infiltrated by novocaine or apothesine solution, care being taken to carry the injection well underneath as well as over and around the fistulous tract. Heated bismuth paste is then injected into the external opening and will emerge promptly from the internal opening. A soft annealed silver wire probe of a small enough gauge to enter the fistulous tract without any force is passed from the external opening. The internal extremity of the probe is grasped with a fine hemostat and brought outside of the anus and the two ends twisted together. This forms a tractor upon which the fistula is threaded. The fistula is then carefully excised while threaded on this tractor. One must be careful not to injure the sphincter and if any of its fibers are incised these incisions must be made at right angles to them. All overhanging skin must be trimmed back to at least half again the width of the wound. A piece of rubber tissue is inserted as a drain. It may be necessary in order to control oozing to use gauze for pressure. These wounds should never be packed.

The presence of gauze packing tends to stimulate the growth of fibrous tissue. This often means an overgrowth of fibrous tissue and consequent distortion of the parts. Many cases of sphincteric incontinence have been caused by gauze packing preventing the severed ends of the anal sphincters from reuniting.

No cases of anal fistula should be operated upon in office practice unless the patient is kept under constant observation until the wound is completely healed. Many a properly performed fistulectomy when followed by careless, negligent or improper after-care has resulted disastrously. Meticulous after-care is of the greatest importance in all cases of anorectal surgery. It is this careful attention to details which distinguishes the higher percentage of successful results following operations performed by proctologists compared with that done by the surgeon who only occasionally treats patients suffering from anorectal disease.

TONSILLAR ELECTRO-ENUCLEATION VERSUS TONSILLAR COAGULATION*

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ELECTROSURGERY is rapidly assuming its long awaited and rightful position as a valuable adjunct to medicine and surgery.

As is the case with all newly introduced agents, it has been made to run the gauntlet. In fact, electrosurgery has been subjected to more than the usual amount of bantering. It has proved to be a good advertising medium for the charlatan. It has been a good business proposition for the medical man, with the money first characteristic. These conditions will always exist. Therefore it is not the purpose of this paper to condemn individuals. It is intended that all attacks be directed toward a procedure as an entity. These attacks shall not be biased. They shall be supported by scientific proof. An endeavor will be made to thoroughly destroy an existing wrong procedure.

For years advocates of a specifically proved, pseudosurgical procedure will persist in their adulations, this support being continued despite scientific evidence to the contrary. This has been true of tonsillar coagulation.[1]

It is the hope that the thoughts here given will be granted consideration. Having been considered, that they will conclusively prove the error of tonsillar coagulation, as compared with any form of enucleation; this being particularly true of electro-enucleation.

Tonsillar coagulation means the application of a damped bipolar high-frequency current to the tonsil.[2] This is accomplished by thrusting a suitable electrode into the tonsillar tissue. (Figs. 1, 2.) This electrode usually consists of a slightly curved sewing needle, held in an appropriate handle. It is the active electrode.[3] The disbursing electrode is usually applied through the close application of a large block-tin applicator. (Fig. 2.) This is applied to any convenient part of the body, usually the back. The complete technique consists of many thrusts by the active electrode into different parts of the tonsil. The current is applied by pressure on a footswitch at the completion of each thrust. In this way the desired, supposedly complete, coagulation of the tonsillar surface has been effected. Only one tonsil, as a rule, is treated at a time. Usually eight days are allowed to elapse before the other tonsil is so treated. This procedure is continued over more or less time, sometimes several months, until the tonsils have apparently disappeared.

As a result of coagulation, the tonsil in all instances is greatly reduced in size, even from the time of the first current application. This reduction in size is due to dehydration and tissue necrosis. It is possible to cause an apparent disappearance of the whole tonsil with but one application of this coagulating current. In these instances, however, great pain and marked dangerous edema in the surrounding soft parts result. Such heroic treatment causes severe subsequent sloughing and bleeding. This condition is not a necessary sequence. One adept in the use of the current and technique will not be thus embarrassed.

The claims made for tonsillar coagulation are many. The more important ones will be given. There is said to be an uninterrupted social or business life. It is said to be a painless and bloodless operation. Further that there is an immediate cessation of all local and systemic symptoms, this cessation being accompanied by a rapid return of the body to normal physiological functions, these functions having

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been previously impaired by absorbtion from the focus of infection.

A true fact, regardless of the ability of the operator, is that a high frequency current is no selector of tissue, the directional forces being toward the disbursing electrode (Figs. 2 and 3). It is therefore impossible to gauge the depth or breadth of coagulation when the current is used, as described in tonsillar coagulation. The predominant idea of the operator is to cause no destruction to vital tissues. The realization of this idea, without leaving portions of tonsillar tissue, is an impossibility. If the process is carried far enough to cause the destuction of the entire tonsil, there will result a necrosis and edema of vital parts adjacent thereto. Great pain and bleeding will subsequently follow. This is particularly true of the superior pole of the tonsil. In the great majority of instances this portion reposes high up in the soft parts. It is completely surrounded by soft, vital tissues, excepting for its base. To completely necrose this submerged part must result in the formation of fibrous infarcts, in which more or less non-tonsillar tissue has been deprived of nourishment, causing its death. Irreparable damage has thus been done, this damage having been death to vital structures with subsequent malformations (Fig. 4), accompanied by great pain and danger to life. Through the exercising of great care, however, the usual end result is the complete detachment of the superior pole from the central lobe. The ever-protecting mucous membrane hurries its repair, thus quickly covering the denuded

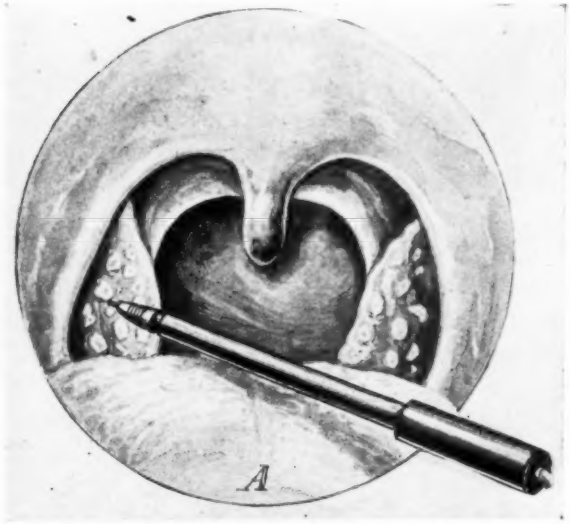

Fig. 1. A. Active electrode in process of coagulating tonsillar surface. White spots showing previous applications of coagulating current having been thus applied.

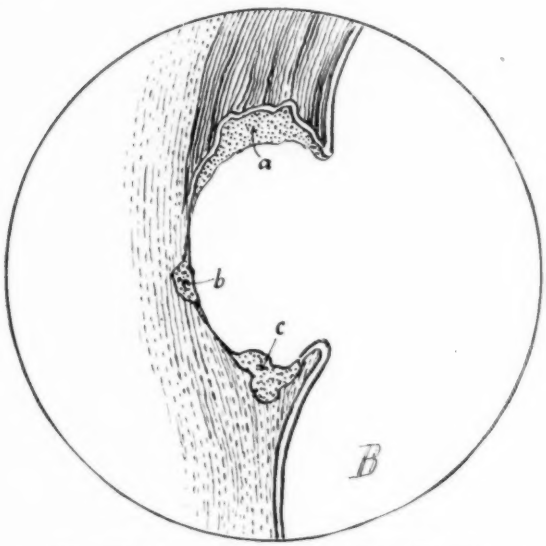

Fig. 1. B. Tonsillar fossa showing buried tonsillar tissue. (a) Superior pole; (b) a small piece of central lobe; (c) inferior pole.

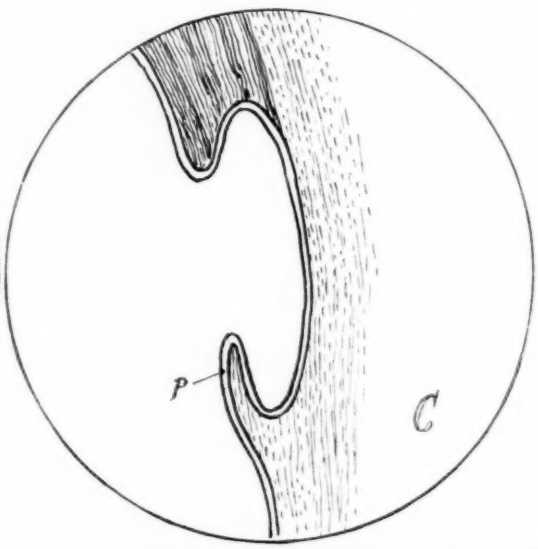

Fig. 1. C. A clean fossa. (p) Retained plica triangularis. (The writer in all instances attempts to retain this important anatomical structure. It is believed that its removal accounts for complaint of dry throats.)

base of this detached portion, this rapid repair undoubtedly being due to the stimulating effect of the current.

Fig. 2. Application of large disbursing electrode to back, and active electrode thrust into tonsils. Directional forces of current are shown toward, or away from, tonsil into vital underlying tissues.

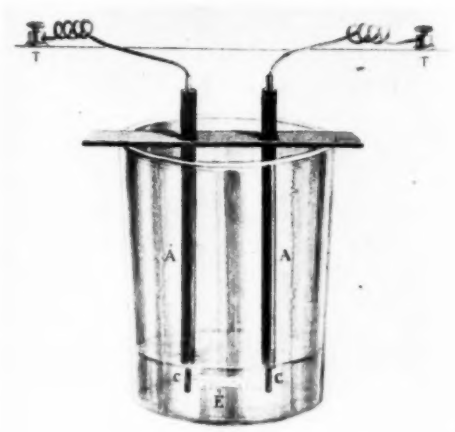

Fig. 3. Method of demonstrating double active electrode principle, showing directional forces. T, terminals of high frequency current. C uninsulated portion of equal-sized electrodes suspended in egg albumen. E, Coagulated portion. This demonstration is only possible when current is applied gradually from zero to predetermined point for condition to be met. With any other application of current, it is impossible to prevent one or the other electrode from assuming rôle of active electrode. This procedure is accomplished by use of rheostatic foot switch, introduced by writer.

The result in a very short time following this separation is a complete smooth clean covering of mucous membrane. This covering constitutes an absolute blind for the thus submerged tonsillar tissue.

Fig. 4. Postoperative mutilation; anterior pillars and uvula have been removed. Posterior pillars have become attached to posterior wall of naso and oropharynx, resulting in partial occlusion of normal opening. (This occlusion is often complete.)

A like burying is of course possible, and is actually the case in many instances, in other parts of the fossa. (Fig. 1. B.)

Fig. 5. Bipolar, electro-enucleating tonsillotome being applied to tonsil. Snare is active electrode, seizing forceps is disbursing element.

The length of time before the buried focus in the throat will be manifested systemically is problematical. The factors determining it are: the size of the submerged piece of tissue, the size and virulence of the colonies of organisms contained therein, plus their ability to withstand local extermination, and to send out vanguards to the distant systemic points.

Local and systemic symptoms will subside, following any form of tonsillotomy, granting that this organ has been obliterated. More often, however, they are but held in abeyance. The normal physiological activities are, for the imme-

Fig. 6. Tonsil has been engaged, snare drawn taut. Seizing forceps have been closed. Current may now be applied. Carriage to be drawn backward simultaneously, thus severing tonsil at its base. Proportional current properties being 88 per cent cutting and 12 per cent coagulating. This proportion being maintained for various sized masses, by varying time element that current is held in contact.

the provocative cause thereof. The cessation of the systemic symptoms is the result of the respite granted the phagocytic

Fig. 7. Tonsil has been engaged in open snare. In this instance, snare has retained its position as active electrode. Disbursing electrode is separate seizing forceps (Fig. 8).

forces. This respite is due to the partial reduction in the number of the invading organisms; and to more or less destruction of their primary breeding place, the tonsil. Thus this temporary cessation of hostilities at the primary source enables the protective forces to focus their attention on the more distant secondary systemic foci. In those individuals still retaining a fair amount of general resistance these secondary foci are oft-times completely

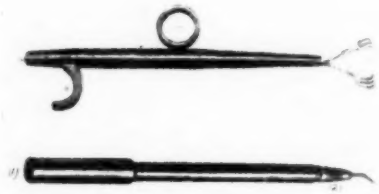

Fig. 8.

Fig. 9.

Fig. 8. Separate monopolar seizing forceps. This instrument may be used in connection with "radio-knife" or dissector (Fig. 9), in any type of surgery, i.e. removal of malignant tumors, etc.

Fig. 9. "Radio-knife," or dissector. May be used as stated (Fig. 8), or to fulgurate bleeding points.

diate time at least, allowed to function unhampered. In this way, a normal standard is approached.

It is well-known when an individual has sought relief from systemic manifestations of a primary focus of infection, the incomplete removal of this focus or the formation of a new one is early recognized by the return of these secondary conditions. They are usually in a more aggravated

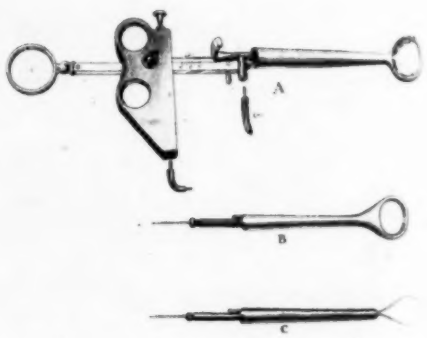

Fig. 10. A. Electro-enucleating tonsillotome with attached seizing forceps. (a) Snare wire which is active electrode; (b) disbursing electrode connected to seizing forceps.

B. Interchangeable plain loop for use with separate seizing forceps (Fig. 8).

C. Interchangeable open snare for use in dissection method or for securing small pieces. Also used with separate seizing forceps.

form, and increased in disseminaton, the end-result being a complete breaking down of the physiological entity. This complete

cessation of normal function oft-times is hastened by the ease of invasion of an epidemic organism, the protective powers of the body being unable to cope with this new menace, because of the existing endemic situation.

Rhoads and Dick[5] have presented what seems to me an excellent treatise on this particular subject. I am herein presuming to quote varbatim their comments and conclusions:

COMMENT

The most frequent object in removing tonsils is to rid the body of tissue harboring bacteria capable of producing disease in other parts of the body.

Yet it is shown by this work that tonsillectomy as usually done, even by specialists of established reputation, fails to accomplish this end in 73 per cent of cases because of incomplete removal of infected tonsillar tissue.

There is even some indication that in many instances the condition resulting from incomplete tonsillectomy is worse than that existing before operation.

CONCLUSIONS

Pieces of tonsillar tissue of appreciable size were found in the throats of 73 per cent of persons who had undergone tonsillectomy.

That these "tonsil stumps" have considerable clinical significance is shown by the fact that in the fairly large series in which cultures were taken the "stumps" harbored more pathogenic bacteria per gram than tonsils removed for the first time. Also there are clinical cases in which patients with systemic diseases attributable to foci of infection failed to improve after their original tonsillectomy but improved strikingly after removal of the pieces of tonsillar tissue remaining from the first operation.

The complete removal of all tonsillar tissue is necessary when the operation of tonsillectomy is undertaken.

With these most fearsome possibilities ever present, why should tonsillar coagulation continue to exist as a procedure? To further nullify its right to continued use, is the existence of a method, or procedure, which does all that may have been claimed for tonsillar coagulation, plus the eradication of its now known dire possibilities.

Fig. 11. Sinus tonsillaris, after removal of tonsil (right). The anterior pillar is held aside to show cleanliness of removal. It also shows total lack of undue traumatization of vital structure.

Tonsillar electro-enucleation, as implied, removes the tonsil *in toto*, immediately. A full descriptive technique will not be given here, this having been done on several previous occasions.[1,4] The results, however, of tonsillar electro-enucleation are:

1. The tonsils are removed in their entirety with one operation. (Figs. 5–10.)

2. The operative and postoperative results are bloodless. This renders the visability of the operative field excellent, thus preventing the possibility of failure to remove all affected tissue. It also thus safeguards all vital structures. (Fig. 1c.)

3. There is a minimum of traumatization of tissue, owing to the ease of manipulation, and the total lack of the necessity of suturing. This reduces postoperative infection to a minimum. (Fig. 11.)

4. The normal instantaneous coagulation of the lumen of the severed vessels renders nil the possibilities of systemic involvement due to metastasis. This fact, especially in the case of malignancy, is a crowning attribute.

5. There is a stimulating effect to the underlying tissues affected by the current, which hastens repair.

6. The psychological impressions, which are always favorable, are not confined to the patients or their parents, but are manifested in the confidence of the operator.

In closing, it is the earnest hope of the writer that any remarks in this paper will not be so misconstrued as to imply other than a sincere desire to protect, primarily, our patients; secondarily, to prevent us, of the profession, from being unwittingly enmeshed.

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OFFICE TREATMENT OF HEMATOMA*

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THE major injuries associated with blood effusion, e. g., hemothorax, perirenal hematoma, and hemarthrosis of the large joints, obviously do not fall within the limits of the title of this paper, which deals with the lesser hematomas of ambulatory patients.

A hematoma, in reality a subcutaneous wound, is a collection of extravasated blood, limited in its extent by the character and resistance of the surrounding structures. In actual practice the term is restricted to blood extravasations which are definitely circumscribed and tend to be spherical in shape. Apart from hemophilia, scurvy, the purpuras and the leucemias, the origin of a hematoma is invariably traumatic.

Section of a hematoma a few days old usually shows a collection of blood-clot with a soft, often fluid, center made up of blood serum. The periphery is firm and organization is taking place there. If the hematoma is located near the skin surface, there will be a series of color changes at first dark blue, then reddish-brown, greenish-yellow, and finally a dirty yellow. The duration of the staining is variable but eventually there is complete return to normal. The clot may terminate in complete absorption or in a small mass of fibrous tissue; rarely suppuration may set in and the course will then be that of a subcutaneous abscess. Still more rare is the formation of a blood cyst with well-formed fibrous wall and yellowish-brown fluid contents frequently containing cholesterol crystals. Ossification is infrequent but occurs insubperiosteal hematoma, and particularly following large deep hematomas of the thigh where it appears in the *x*-ray as a lamina external and parallel to the cortex of the femur.

Diagnosis can usually be readily made in recent cases but in the later stages doubts may arise because of heat, tender-

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ness and fluctuation or when the swelling is deeply situated complicating conditions must be excluded by the usual methods.

Judging from the comic papers, hematoma is very common in the scalp. This is far from being the case as a linear wound is the usual lesion. The classic differential diagnosis between depressed fracture of the skull and hematoma of the scalp need cause no concern as skull fracture in the absence of a scalp wound is practically unknown in adults.

In the well-known "black-eye" the effusion appears very rapidly but if firm pressure be applied immediately it may be successfully limited; however, if an hour has elapsed nothing is to be gained from such treatment; a small piece of adhesive placed along the eyebrow will, in some measure, conceal the bruise.

Hematoma of the ear occurs among boxers, wrestlers, and foot-ball players. In untreated cases it results in the unsightly "cauliflower ear." Immediate treatment should succeed in evacuating the effusion as far as possible through a short incision made in the fossa of the helix, with strict asepsis. A small sterile pad is placed over the wound and a moulded soft copper wire is applied to the fossa of the helix. The auricle is then lightly padded and firmly bandaged to the side of the head. The dressing may be removed after forty-eight hours when there is little fear of the destruction of the cartilage which results in "boxer's ear." It may be noted as a curiosity that hematoma of the auricle was so common in hospitals for the insane that it was known in England as "insane ear."

Hematoma of the nasal septum may occur following trauma and should receive the attention of the rhinologist.

Injury to the female breast not infrequently results in a hematoma which may give rise to confusion in diagnosis. Spontaneous absorption is the usual course. Hematoma of the abdominal wall may be due to trauma, rupture of the rectus muscle or bleeding from the superior or inferior epigastric vessels. The diagnosis is seldom made in bleeding from the epigastric vessels, the hematoma being recognized usually in the course of laparatomy.

Hematoma of the thigh or calf presents no unusual features. In the case of hematoma of the shin, there may be pain for a considerable period of time due to the subperiosteal hematoma frequently referred to as "bone blister." In the perianal region the thrombotic hemorrhoid, really a subcutaneous clot, is of common occurrence and is readily evacuated under local anesthesia. The subsequent small wound heals rapidly.

Hematocele of the spermatic cord or tunica vaginalis is not uncommon. The effusion into the cord may be safely left to absorb. In the case of the commoner scrotal hematocele there may be considerable difficulty in diagnosis. For this reason when there is reasonable doubt it is safest to advise exploration of the scrotum, having first obtained permission for orchidectomy, so as to deal with the pathological condition present. This, of course, is not an office procedure.

Crushing injuries of the hand and foot sometimes cause large diffuse hematomas. In these cases it is important to exclude fracture by *x*-ray. Blows on the nail or squeezing injuries may cause subungual hematoma which slowly absorbs, frequently with loss of the nail. If the nail is loose it may be easily removed, with or without block anesthesia. The only possible diagnostic difficulty is the occasional masquerading of a subungual melanotic tumor in the guise of a hematoma, and consequent delay in radical treatment.

Treatment. In certain early and selected cases, incision and evacuation of the clot with subsequent application of a pressure dressing meet the indications. Notably is this the case with the auricle and the thrombotic external hemorrhoid. With these exceptions and in the absence of pus formation, intelligent neglect is probably best and under conservative measures, absorption and complete resolution may be confidently anticipated in near-

ly all cases. Judicious employment of heat, the whirlpool bath, light massage, and moderate pressure are of assistance in the removal of the serum and clot. Movement both active and passive stimulates the circulation and prevents adhesions and atrophy of muscle. Suppuration should be watched for but a word of caution is necessary. More often than not, a hot tender semifluctuating swelling following some days after an injury and associated with mild pyrexia is found on incision to be free of infection. In other words, it is difficult to be sure of the presence of pus in a hematoma, and aspiration of pus should precede incision. A blood-cyst will in relatively recent cases be satisfactorily healed by aspiration; old-standing thick-walled cysts, however, require complete resection.

THERMAL AND CHEMICAL INJURIES*

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IN the treatment of thermal and chemical injuries, the doctor must have at his command the various agencies that he will have to use in treating the lesions. The first requisite is to relieve pain, combat shock and to dress the wound so that infection will not set in. For pain use hypodermic injection of morphine, for shock use stimulants and maintain heat by means of hot-water bottles.

First-aid treatment of injuries is the prime requisite of the doctor so that the course of healing will go on without interruption. Many of these cases, however, come to the office already infected. An infected wound, whether from burn or other injury, should be treated at once with the idea of relieving congestion and avoid spreading of the infection. Splinting the parts and putting the tissues at rest is the first essential. Removal of foreign bodies and the cutting-away of dead tissues will facilitate drainage.

Should there be evidences of pus formation in the deeper tissues, incision and putting in a wick moistened with tr. iodine or mercurochrome will afford further drainage. Having placed the parts at rest and given free drainage, the wound should be covered with gauze saturated with a solution of boracic acid. Be sure to have the entire gauze covered so that the gauze will not dry.

The treatment of burns depends upon the degree of burn. The superficial burn of the epidermis which has produced the formation of serum is best treated by incising the membrane and allowing the serum to escape. If the area burnt is not too large, the raised epidermis can be cut away entirely, leaving the denuded area to be treated with moist dressings of boracic acid or a 2.5 per cent aqueous solution of tannic acid.

Should there be an extensive burn apply either boric acid or compresses saturated with 2.5 per cent freshly prepared aqueous solution of tannic acid or gauze moistened with 1 per cent or 2 per cent picric acid solution and apply bandage. This will be sufficient protection for tranference of the patient to either home or hospital for further treatment by any of the well-known methods. If the burn is extensive, skin grafting should be done early. If performed early before much cicatricial tissue has formed, the graft will be more apt to adhere.

Deep electric burns are very tenacious and resistant to treatment. Avoidance of infection, cutting away sloughs as nature loosens up the areas, application of nitrate

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of silver here and there and the boric ointment or zinc oxide ointment will stimulate the healing.

In frost bite initial treatment is the most important point. Avoid putting the parts in hot water at first, but attempt to bring back the circulation gradually. If the skin is livid and not yet gangrenous treat the parts by friction with snow or rubbing with towels soaked in iced water. Then as the skin becomes warmer and congestion disappears dry friction should be used and the parts wrapped in cotton.

Should there be gangrene of any of the parts it is a good rule to wait for a definite line of demarcation. Do not be too hasty to amputate.

Chilblain is a secondary effect of cold. Rub the parts daily with alcohol and apply friction with a course towel. For hyperemia of the skin use zinc-oxide ointment to which a small quantity of carbolic acid or menthol has been added to relieve the itching.

In handling cases resulting from chemical burns, such as carbolic or nitric acid, the resulting necrotic area must be dressed either with boric powder or a solution of boric acid. If the gangrene is not deep the dead skin can be cut away and the underlying parts will in time slough away. Should gangrene be present in parts of fingers or toes one must again wait for a definite line of demarcation before amputating.

Roentgen-ray and radium burns are most difficult to manage, and heal slowly. After the ulcerating area has healed skin grafting in the shape of thick flap grafts have been most successful and resulted in prompt healing.

SURGICAL CONDITIONS OF THE EAR*

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In otology, as in the practice of any other surgical specialty, there are several pathological conditions which lend themselves safely to surgical treatment in the office. Such surgery, of course, is understood to be the performance of a minor operative procedure which does not in any way interfere with the patient's return to his home soon after. Anything that might possibly arise to necessitate confinement to bed contraindicates the performance of surgery in the office.

Ordinarily, the performance of a myringotomy, the removal of an aural polyp or granuloma, the removal of a necrotic ossicle, the incision of an abscess in the soft parts and the removal of cysts of the auricle can safely be done in the office and the patient sent home soon afterward. In each of these procedures certain precautions must be observed; and contraindications exist at times which preclude the use of surgery in the physician's office. It is not the purpose of this paper to set forth the indications for operation, but merely to formulate a set of didactic rules for the contemplated procedure.

A myringotomy is usually more aptly performed, and the incision more correctly placed, in children above the age of three years and in adults who are extremely nervous, when the patient is given a general anesthetic. In children the use of ethyl chloride inhalation, administered so that an analgesia rather than an anesthesia is produced, does not in any way interfere with the patient's return to his home. Adults who require an anesthetic are best sent to a hospital where they can stay over night until the effects of the narcosis completely disappear.

As a rule, however, no anesthetic what-

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soever is needed. Children are mummified and the head held tightly by an assistant during the surgical procedure. Adults are told that an incision will be made in the drum which will cause a certain amount of pain, but that this pain will be no more severe than that which the disease itself is causing them. Some otologists employ a mixture of cocaine and phenol as a local anesthetic applied to the drum.

The myringotomy itself should always be performed in such a way that the knife at no time impinges on the inner tympanic wall, for injury to the latter exposes the labyrinth to infection. Strict surgical asepsis should be observed so as to minimize the danger of a secondary infection. In infants, especially, care must be exercised not to incise the skin of the external canal, since injury to this structure may be followed by infection and cellulitis of the soft tissues.

Aural polyps and granulomas also lend themselves to office surgery. Before operation is undertaken, however, one must be certain of the exact origin of the new growth. These conditions are usually found in the chronic otorrheas, both with and without bone necrosis. They are a result, either of an exuberant connective-tissue proliferation following an irritant or of the confluence of the connective-tissue resorption foci in the bony tympanic walls which indicate the area of sequestrating bone. The former type is found in chronic purulent otitis media due to suppuration of the tympanic mucosa. The lesion usually springs from the inner surface of the drum, the mouth of the Eustachian tube and, occasionally, from the promontory. The latter are found in the necrotic otitis of scarlet fever and in the chronic otorrheas of the dangerous type, including cholesteatoma and tuberculosis. They usually spring from the attic and their base is broad and formed by the connective tissue of the resorption foci in the bone. Through this connection they may be in intimate contact with the membranous labyrinth, if the bone is entirely necrotic; or a path for the spread of infection exists preformed through the vascular channels leading from the granuloma into the bone. These are the polyps which should only be removed by a radical mastoid operation, never through the external auditory meatus. Those springing from the other sources already mentioned may safely be removed in the office.

Polyps are best removed with the cold snare. They should never be pulled out. The procedure that I follow is to remove the greatest portion of the polyp until the base and attachment are clearly discernible. I then cauterize the base at a second sitting with either silver nitrate or trichloracetic acid. Hemorrhage following this operation is usually negligible and is easily controlled by the application of adrenalin chloride.

In this connection, we may consider also the removal of the granulations which form after a radical mastoid operation. These are the result of ingrowth of the implanted squamous epithelium over the healthy connective tissue granulations which spring from the raw bone surface and of the irritating effect of one upon the other. They are always noted at the margin between the squamous epithelium and the granulating surface. I have found that they usually disappear of themselves and rarely need to be removed. As the epithelium advances, it covers these exuberant granulations and finally covers them; and the granulations recede and shrink. If they become excessive, however, and tend to delay epidermization, they may be removed with the curette or with a small biting forceps.

The removal of polyps and granulomas is best done in the office under local anesthesia. A 1 per cent solution of novocaine containing a few drops of adrenalin is injected at the posterosuperior angle of the external auditory canal. About 2 c.c. are sufficient to anesthetize the entire middle-ear mucosa.

Rarely is one called upon to remove a necrotic ossicle. Occasionally, however,

cases of chronic suppuration with a marginal perforation are seen wherein the entire middle ear has been healed and covered by epidermis and wherein a discharge still exists although no cholesteatoma is present. In such cases an isolated necrosis of the malleus or the incus is often found to be the offender; and a removal of these necrotic structures will cause a cessation of the lesion. Where the malleus alone is involved, it can safely be removed in the office, employing the method of anesthesia just mentioned. The portion of the drum attached to the malleus is ncised with longitudinal incisions placed on either side of the malleus and extended upward until the outer bony attic wall is reached. The malleus is then grasped with a Hartmann forceps or other suitable instrument and gently rotated until its articulation with the incus has been severed. The attachment of the tensor tympani muscle is cut through with a small tenotomy knife placed anterior to the long process. The severance of this muscle should be done by carrying the cutting edge of the knife first upward and then downward and outward. The malleus is then removed gently. Where it is necessary to remove the incus, also, the entire procedure had best be performed in a hospital, since the danger of disturbing the stapedio-fenestra articulation, with a resultant labyrinthitis, is too great to risk in the office.

The incision of a fluctuating abscess of the soft tissues of the auricle, canal or mastoid process can be performed in the office provided that the abscess is not the result of a suppurative mastoiditis. In the latter instance, the subperiosteal abscess is part of the suppurative mastoiditis and should be treated at the time of mastoidectomy. Other abscesses, such as those due to broken-down lymph glands, furuncles or post-erysipelatous foci of purulency, can be incised with the use of a local anesthetic, preferably ethyl chloride sprayed over the affected area.

A recurrent acute infection of a mastoid previously operated upon will often evince itself by a bulging of the scar due to an accumulation of pus within the mastoid cavity. Where the surgeon himself performed the primary operation and has an exact record of the anatomy of the parts and the areas of endocranium exposed, in such a case of recurrence he may safely incise the protruding area in the office and evacuate the pus. Where someone else has performed the original operation, it is better to hospitalize the patient and carefully expose the mastoid wound. I have in mind one such case wherein the incision over the mastoid area was found, upon reoperation, to be placed directly over a large area of exposed cerebellar dura. Had this case been incised in the office, the incision would have penetrated the dura and entered the cerebellum.

Sebaceous cysts of the ear which are situated above the auricle and are not intimately connected therewith can be nicely dissected from their bed under local anesthesia. This can be done in the surgeon's office. An injection of 1 per cent novocaine around the area of operation completely blocks it and renders it painless during the surgical procedures.

There are certain general conditions which influence the decision of the physician as to whether or not he should perform an operation in his office. Debilitating diseases such as diabetes, tuberculosis, chronic nephritis and arteriosclerosis contraindicate office surgery. The complications that these conditions bring about in themselves warrant hospitalization for the benefit of the patient and the legal protection of the doctor. Then again, there are some highly neurasthenic and impressionable individuals who will always magnify postoperative symptoms. These people are very difficult to treat after operation in any event; and they are likely to believe that the surgeon minimized their condition at the outset by operating upon them in the office. They will always feel that had they been sent to a hospital and proper emphasis placed upon the

seriousness of their condition at the start, they would not have had the same amount of suffering. All this, as well as the pathological condition itself, has a bearing on whether or not a surgical procedure should be undertaken in the office.

SEBACEOUS CYSTS*

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SEBACEOUS cysts are tumor masses occurring in the skin and are due to the occlusion of the ducts of sebaceous glands. They are most prone to occur on the head, face, and neck but may be found anywhere that sebaceous glands occur. They vary in size from that of a small pea to that of a walnut, and inasmuch as they arise from the skin itself the skin is not freely movable over them. They consist of a discreet sac filled with a cheese-like substance, the result of sebaceous gland secretion.

Treatment consists in complete removal by excising a small ellipse of skin over the apex and dissecting the sac out intact. If infection is present incision and later a complete and more difficult dissection may be necessary, but the whole sac must be removed or recurrence is likely. If there is any question as to whether any sac remains the cavity should be swabbed with phenol and alcohol and twenty-four hour drainage instituted.

TENDON CYSTS

The most frequent site of tendon cysts is about the wrist or over the dorsum of the hand. When present they are easily brought into relief when the tendon is put on the stretch.

They consist of very thin walled sacs of synovia-like material about the size of a small cherry and are filled with a clear straw-colored, very thick gelatinous material which can only be aspirated through a large bore needle. Though of the tendon sheath, there is no open connection with it.

Treatment. Occasional cures are secured by putting the cyst under tension and smashing by a sudden blow of a book. Aspiration and continued pressure may relieve a few, but the injection of an irritating substance such as iodin is not advisable. The only sure method is to remove them completely, which is easily done if the sac is not ruptured in the process. Those occurring on the deep tendon of the wrist are somewhat more difficult and require more care in dissection.

PREPATELLAR BURSITIS; HOUSEMAID'S KNEE

The prepatellar bursa, situated in front of the patella, may become inflamed from acute or chronic traumatism, more often the latter and seen most frequently in persons whose work requires constant kneeling. The bursa when distended may vary in size from that of a small pullet's egg to that of half an orange and may or may not be acutely tender. It is not connected with the knee joint.

Treatment. Acute cases may sometimes be relieved by aspiration and tight adhesive strapping for a prolonged period, repeating the aspiration as indicated. If this does not suffice they should be completely removed. In chronic cases, especially those in which rice-bodies are present, removal is almost always indicated. This can be accomplished fairly easily under local anesthesia by means of an elliptical incision, removing sufficient skin for neat closure, and careful dissection to remove the sac intact. Close without drainage and apply pressure. No disability results from the absence of the bursa.

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TREATMENT OF FLAT FEET*

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PAIN in the feet and legs is one of the most common of ailments and one that is very distressing in its effect both mentally and physically. The proper treatment of such pain naturally presupposes the proper diagnosis of the condition causing the pain. Various conditions will cause pain in feet and legs. Flat feet must be differentiated from the following conditions: Intermittent claudication and sciatic pain caused by arthritis or low back strain. A careful history that the pain comes after walking two or three blocks and stops as soon as the patient stops for a moment or two, combined with the inability to palpate the dorsal artery of the foot is practically diagnostic of intermittent claudication. To eliminate sciatic pain from our diagnosis it is necessary to examine the back for tenderness about the sacroiliac joint, to apply the Kernig test, i.e., straight leg raising, and also the history should show that the pain really travels downward in most cases at least, instead of upward. Eliminating these two causes in the feet and legs, there are three main groups of foot disability: foot strain, weak foot, and flat foot. The flat feet are of two kinds, the flexible flat feet and the rigid flat feet.

TYPICAL SYMPTOMS OF FOOT DISABILITIES: ALL DEGREES OF DISABILITY FROM SLIGHT TO EXTREME

There is an aching in the feet and legs with a greater tendency to tire, especially upon standing or walking. This aching is usually relieved by rest and the removal of weight-bearing. It is often relieved also, by rest in bed, hence is much better in the morning, comes on again toward noon and then after a rest returns in the afternoon. It is relieved by bearing weight on the outer sides of the feet. Therefore, examination of the heels of such patient's shoes, will often disclose their being worn. These feet are sometimes subject to excessive perspiration due to interference with the circulation, and are often cold and clammy.

Such patients are often able to walk long distances, but upon even short periods of weight-bearing in standing position, the feet ache excessively. These patients have slovenly gaits, the feet are everted and the knees bent inward. Upon examination the feet of these patients divide themselves into three groups: simple foot strain, weak feet, and flat feet. In foot strain the foot is very flexible but even upon weight-bearing there is very little eversion of the foot, although marked tenderness is produced upon pressure beneath the astragaloid scaphoid ligament. This is a rather acute condition as will be brought out in the history.

There is another group of feet, however, which I classify as weak feet in which there is marked eversion of the fore part of the foot, prominence of the scaphoid, and many times complicated by a short heel cord which does not allow the foot to be dorsiflexed beyond a right angle.

Another variety of painful feet is known as flat feet. These divide themselves into the two groups, flexible and rigid. The flexible flat feet, are relaxed and everted with the scaphoid many times flat upon the ground, entirely obliterating the longitudinal arch. There is another type of flat feet known as rigid flat feet which are stiff in this pronated position with more or less spasm of the peroneal muscles which can easily be demonstrated upon attempting to supinate the foot.

One other type of foot disability is known as anterior metatarsalgia or Morton's toe, which is a most painful disability in the fore part of the foot. There is a

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painful cramp or needle-like pain in the region of the base of the fourth toe and extending into the fourth toe. This pain is periodic and when it comes is intolerable but is relieved usually by removing the shoe, massaging and manipulating the joints of the anterior arch of the foot. Many times a callous is demonstrable on the ball of the anterior part of the foot which is a compensatory thickening of the skin, nature's attempt to keep the bone from wearing through the skin. This is more frequently girls and women than in men, although some men do have it. It may or may not be present along with a flat longitudinal arch.

ETIOLOGY OF THESE VARIOUS CONDITIONS

These foot disabilities are usually caused by inability of muscular effort to bear the weight. In most cases there is a laxness of ligaments which is very commonly overlooked, but can easily be demonstrated not only in the foot, but by hyperextending the elbows, etc. Because of this relaxation of the ligaments, strain is thrown upon the muscles, hence the pain comes from muscle strain and tire and not directly from the flat foot *per se*. A standing occupation is often the cause throwing the constant strain upon these muscles. Bad shoes are most fruitful causes of foot disability. The modern shoe manufacturer has very little regard for the proper lines of the foot in the manufacture of shoes. They make a pointed toe which has the same curve on the inside as on the outer side. Of late, shoes have been made of most inelastic leathers, such as snake and lizard skins, which cannot be stretched to relieve pressure on the toes and joints. Also the high narrow spike heels that many women wear throw practically the entire weight of the body upon the fore part of the foot and produce a very marked instability, although some of the weight is carried underneath the longitudinal arch, because the French variety of heel is actually forward beneath the scaphoid. All these factors result in stretched ligaments. Even new facets are formed on the bones near the normal joints after long periods of time.

Osteophytes and thickened periosteum are found in the variety of rigid flat feet which is often complicated by arthritis. There is marked muscle atrophy of the unused muscles and contracture of certain of the muscles, especially the calf and peroneal muscles.

TREATMENT OF FOOT STRAIN

Slight cases only require wedging of the heels $\frac{1}{8}$ or $\frac{1}{16}$ inch on the inner sides of the heels, combined with exercises. These exercises consist of actively adducting and dorsiflexing the foot forcibly into supination position and flexing the toes and holding this position for fifteen seconds, then relaxing for a few seconds, and repeated fifteen to twenty times twice a day; also a walking exercise which consists of walking barefoot or in stocking feet on the extreme outer sides of the feet with the foot adducted and supinated as in the aforementioned exercises. The patient should take one hundred steps about the room both morning and evening. Exercises of rising on the toes, in my opinion, often are not so good because they have a tendency to shorten and contract the heel cord and calf muscles.

A pad of saddler's felt carefully shaped and beveled and strapped beneath the foot by adhesive plaster with the foot well supinated, gives immediate and wonderful relief in cases of foot strain. These should be renewed twice a week for two or three weeks and then discarded and combined with wedging and exercising.

More extreme cases require these same exercises and wedging of the heels only, not the soles, for wedging of the soles merely tips the foot over by rotating in the subastragaloid joint, and does not help the longitudinal arch. It was formerly thought necessary to fit such cases with

arch supports of metal, either molded on the Whitman or Boston models, but of late years I have used a shoe which is manufactured with rigid shanks using a strip of steel which, in my experience, very seldom breaks. This shoe, combined with a simple insole in which is a felt pad inserted in a pocket, makes a very light and efficient support so that very seldom is it necessary to fit a steel support.

Extreme degrees of flat feet are of two kinds, flexible and rigid and need entirely different treatments. Even the extremely flexible flat feet that give symptoms are best treated by strapping, padding and exercises, plus a rigid arch shoe with heels wedged on the inner sides.

The personal equation, however, has to be considered when it comes to giving exercises, as some will, and many will not, do them. The most doubtful ones are the young girls of sixteen and eighteen years, in girls' schools away from home.

Some of these flexible flat feet particularly in older people, will need rigid steel plates, combined with massage. The rigid flat foot cases are a more serious problem. Some are merely irritable and after putting into casts at rest for a few weeks in supination, followed by massage and adhesive strappings, will soon clear up. Others with marked rigidity and peroneal spasm holding the foot in extreme pronation will require ether anesthesia and severe manipulation and stretching of the peroneal tendons before the reflex spasm will let go. This to be followed with plaster casts for several weeks, massage, adhesive strappings, and an external bar caliper brace for several months. This usually results in a cure, but sometimes has to be repeated.

ANTERIOR METATARSALGIA OR MORTON'S TOE

The diagnosis of this condition is so easy that it can many times be made over the telephone from the history. Upon examination, there is an acute tenderness upon pinching of the fourth metatarsal head between the thumb and fore finger. The cause of this condition is nearly always due to high heels and the narrow-toed shoes with the flexible sole. The fifth metatarsal head which should make one of the supports of the anterior or transverse arch is elevated so that the fourth metatarsal head becomes the buttress of this arch. The lateral pressure of the shoe causes the fifth head to pinch the fourth digital nerve between these metatarsal heads. Many times a callous is seen beneath this fourth metatarsal head and short heel cords is a very frequent complication.

TREATMENT OF METATARSALGIA

A proper shoe is an absolute necessity for the relief of this painful condition. Plenty of width and not too high a heel is necessary. In women, a low Cuban or military heel is allowable. Where formerly a metal anterior arch support was always used, I now use a felt pad either glued into the shoe or fastened into an insole of a rigid arch shoe.

In a very few, and those most extreme cases, an excision of the fourth metatarsal head has been done. For men, in whom this condition is rather rare, an anterior heel devised by Robert Jones of Liverpool for use in the army, is very efficient. This consists of a strip of sole leather fastened obliquely across the sole of the shoe just behind the metatarsal heads.

MINOR PATHOLOGY OF THE VULVA*

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THE vulva, in spite of its exposure to skin germs and its proximity to the three greatest excretory orifices of the body, the anus, the urethra and the vagina, exhibits surprisingly little pathology. Small infections heal promptly and systemic infections rarely develop from it, circumstances which can be explained only on the basis of relative immunity of the vulvar skin. On the other hand, the treatment of vulvar lesions is far from satisfactory. For one thing, the pathology is on the borderline of two specialties, gynecology and dermatology; the structures concerned are definitely gynecological, yet the diseases exhibited are frequently definitely dermatological; the result is that neither specialist assumes full responsibility for them, and treatment is often incomplete and ineffective.

In the second place, while the majority of these lesions are of a minor character, there is a tendency, and I think a very unhappy one, to treat them all as of this sort. Nothing could be further from the facts. The treatment of diseases of the external genitalia implies considerably more than a mere dabbing of superficial surfaces with one lotion or another. It implies, first of all, a most accurate and careful diagnosis before any treatment at all is instituted, and it is just here that most therapy fails. Vulvar conditions are very frequently merely a local manifestation of constitutional disease. Venereal conditions of the external genitalia have an unfortunate way of extending upward if they are not properly handled. Finally, while cancer of the vulvar structures, as Taussig points out in his latest brilliant study of the subject, is next in benignity to fundal cancer, this holds true only if our prophylactic and therapeutic measures are wisely chosen and properly applied. And this, I would point out, is not always the case because of the very tendency I have mentioned, that of regarding all vulvar pathology as of a minor character.

The treatment of vulvitis is based primarily on a determination of its causal agent, which may be an infecting organism, usually the gonococcus, less often the colon bacillus; a constitutional condition, such as diabetes; irritation from chronic discharges high in the genital tract; infection from minor skin abrasions; ordinary lack of cleanliness; or skin diseases such as eczema, herpes, infection of the hair follicles and other skin conditions common to all integumentary regions, which possess no special local characteristics and which are more properly handled by the dermatologist.

The urethra, because of its location, is ordinarily considered as one of the vulvar structures, and it may properly be included in this discussion because gonorrrheal infection is perhaps the most common cause of vulvitis and the urethra is the most common point of origin. Urethritis is seldom seen in the acute stage, and if it is, the proper treatment is absolute rest in bed, particularly during the menstrual periods, if the infection is to be prevented from extending upward. This, however, is not always practical, and, because the disease gives rise to no general symptoms, it is not always submitted to by the patient. Ambulatory treatment, therefore, becomes a matter of expediency if not of wisdom. In such cases, treatment should be strictly limited to the affected parts, and should include little more than dilatation of the lower third of the urethra with a small cystoscope, and painting of this part of the canal with mercurochrome, silver nitrate, or some similar agent in solution strong enough to kill the organisms, yet

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not strong enough to desquamate and injure the tissues. When the disease has reached the chronic stage, and the organism is intrenched in the tissues and cannot be isolated in the discharge, the mere fact of urethral involvement, especially if it is associated with involvement of the urethral and vulvovaginal glands, is so constant in gonorrhea and so unusual in other types of infection, that one might make the diagnosis merely on the history of exposure, plus the typical, flea-bitten appearance of the parts. The same type of local treatment is applicable as in the acute disease, and it must be kept up faithfully and persistently before a cure can be looked for. Isolation of the patient from the source of her infection is, of course, essential. I think it only fair, in view of the excellent results they report, to mention the treatment employed by Kidd and Simpson in their clinic at the London Hospital, urethrovesical lavage, instruction in which is given the patient herself if daily visits to the clinic are not practical. I should hesitate, however, to advocate such radical treatment by the average physician, let alone by the average patient, for I do not see how extension to the bladder and to the upper genital tract can well be avoided.

If Skene's glands are involved, the duct openings of which are evident in parous women as red areolae (in nulliparous women they can be exposed by hairpin retractors or fine silver probes) local applications are seldom efficacious, and the swiftest and surest treatment is cauterization with carbolic or preferably the electric cautery, after the duct has been slit over a probe from the urethral side. Bartholinitis sometimes responds to local treatment, but if abscess formation occurs, dissection of the entire gland is imperative in most cases. The operation is not serious in itself, but it is not an office procedure because of the danger of hermorrhage.

If the vulvitis is due to lack of cleanliness, the remedy is plain. The patient should be instructed to pay special attention to the folds of skin about the genital orifice, and should be advised of the necessity for special care after urination and defecation. In the type of vulvitis which is caused by retention of sebaceous material and smegma about the clitoris, the adhesions about the latter structure are separated, the top of the preputial folds snipped off, and the edges united with two or three catgut sutures. This is a practical office procedure, for hemorrhage is a most unlikely complication.

An investigation of the urine should not be omitted in any case of vulvitis not due to such obvious causes as those we have mentioned, especially if pruritus is a prominent symptom. The decomposition of diabetic urine is a fairly frequent cause of this condition, and the treatment is obviously the correction of the constitutional disease.

Vulvitis may also be caused by any discharge from the cervix, vagina or rectum, and here again the treatment of the disease is the treatment of the causative condition, whether by douches, local applications, curettage, dilatation of the vagina or cervix, or the use of the cautery. The patient's word should not be taken for the existence or non-existence of a discharge. A careful local examination should be made, with microscopic study of the secretions, and the treatment instituted according to the indications. Savill in this connection calls attention to a frequent and unsuspected cause of vulvitis, the leakage of mineral paraffin preparations from the rectum, which may set up an intense vulvar irritation, though the anus and perineum are unusually unaffected. In such cases, withdrawal of the offending agent promptly clears up the condition. I would mention, too, the recent work of Greenhill and Davis on the trichomonas vaginalis, this organism having proved to be a rather frequent cause of a persistent and irritating leucorrhea, and so the cause of vulvitis.

The local treatment of vulvitis is most

often the treatment of its chief symptom, pruritus. This symptom is usually spoken of as if it were a clinical entity, but it cannot be too strongly emphasized that it is not, except in those rare cases in which a definite neurosis exists, or in which, as Taussig points out, the primary cause has been removed but the habit still persists. Scrupulous cleanliness is essential, and hot Sitz baths are helpful. Local irritations must be eliminated, proper drainage of the genital tract must be secured, constitutional conditions, chiefly diabetes, are to be corrected, highly seasoned foods and stimulants are to be avoided, and general hygienic measures are to be employed. Local measures to relieve the itching include applications of weak carbolic acid solutions, silver nitrate solutions, lead and opium compresses, or similar measures. My personal opinion is that simple carbolated vaseline or some salve containing menthol gives as good results as any of the more elaborate combinations, especially if friction from clothing or from vulvar pads is eliminated. If these measures fail, local applications of 10 per cent iodine may be tried at four or five day intervals, and short *x*-ray exposures may prove effective. Following the suggestion of Weiner, I have relieved several cases by repeated infiltrations with novocaine, in a solution of ¼ of 1 per cent, and others with infiltrations of normal salt solution, but unfortunately the good results are not permanent.

Vulvitis in childhood differs from the condition in adults in that it is always associated with vaginitis, and that, if the gonococcus is the cause, as it most frequently is, it can be isolated in the discharge. The youth of these patients complicates the treatment, and the persistence of the organisms in the tissues makes it tedious and trying. Moreover, this disease is highly infectious, and strict prophylactic measures are necessary in the home as well as in institutions if its spread is to be avoided. The treatment consists of full exposure of the parts, preferably in the knee chest position, and thorough painting of the structures with acriflavine, silver nitrate, mercurochrome, or some similar agent, with due care, of course, that the solution is not too strong for the delicate tissues. Douches of the same sort are given daily when possible. Recently I have been using a solution of 10 per cent mercurochrome put up in sterile jelly, injection of which into the vagina has given me rather good results. Graves advocates treatment by hot air, other authorities believe that urotropin should be given regularly to keep the tissues bathed in a solution of formaldehyde, and still others favor the use of gonorrheal vaccines. With these I have had occasional good results in children, and they are worth a trial since, even though their effect is uneven, at least they do no harm. Unremitting cleanliness is the chief requisite, and this, together with persistence in whatever treatment is adopted, is, I believe, more a factor in the cure than the special method followed.

In short, the treatment of vulvitis of all types is little more than the detection and cure of the causative condition, plus such local measures as will add to the comfort of the patient and will relieve her of the discomfort of the pruritus, which is usually the chief symptom. Acute conditions of gonorrheal origin are best handled by absolute rest. And finally, one must never forget the possibility of cancer of the vulva, which may be overlooked. In this connection a word might be said about leucoplakic vulvitis, which may or may not go on to kraurosis, but which, according to Taussig, although benign in itself, is associated with malignancy in at least half of all cases. *X*-ray and radium give poor results, glandular therapy cannot be relied on, but vulvectomy is both prophylactic and curative, and no time should be wasted on the trial of superficial measures before this radical one is resorted to.

Chancre plainly demands no local treatment except cleanliness; the cure here depends upon the treatment of the constitutional syphilis. Chancroid, on the other

hand, is amenable to local measures, though healing is often a slow process because of the resistance of the deeper structures. Cauterization by carbolic or the electric cautery probably gives the best results, with the use of antiseptic powders during the healing stage. Diathermy has also been advised. If the inguinal glands are involved, however, ambulatory treatment must cease and the patient must be confined to bed.

The so-called venereal warts which appear on the perineum, the mons veneris, the labia or the mouth of the vagina, are, in non-gonococcal cases, usually due to lack of cleanliness and will disappear without treatment. This is especially true of the type which appears during pregnancy. If treatment is indicated, a strong astringent solution of lead or opium, or some antiseptic powder is usually sufficient, though sometimes they must be cut off under novocaine and the bases touched with carbolic or the cautery.

The hymen may be involved in any of the infections and inflammations we have described and the treatment is the same. A special type of vaginismus may be produced by its failure to rupture during coitus, the abrasions and infections which follow the injury in turn producing sensitive granulations. In cases of this sort, after the infection has cleared up, mechanical rupture may be done. Vaginismus may be treated in the office by graduated dilatations, if no local conditions such as fissures, caruncles, vulvitis, etc. are found to be responsible for it. For true vaginismus psychotherapy is usually necessary.

A thick, fleshy hymen may call for incision and mechanical rupture, but other anomalies of this structure as a rule offer no bar to coitus and subsequent conception, and so demand no treatment. On the other hand, imperforate hymen associated with hematocolpos is a potentially grave condition, and I would utter a very serious warning against attempting its correction anywhere but in the operating theater, under the strictest aseptic precautions. It is the sort of pathology which illustrates perfectly the point I have endeavored to make concerning the limitations of office treatment. On the surface, nothing seems simpler than the puncture of the imperforate structure. Actually, there are few operations in gynecology with greater possibilities of a subsequent sepsis, and here, as in many other cases, judgment rather than skill must decide what can and what cannot be done within the limitations of the office.

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COLLODION TREATMENT OF BOILS AND CARBUNCLES*

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A BOIL is a local staphylococcus infection in the skin. As the skin is a dense structure and the staphylococcus usually is not a very virulent organism, the result is a limited amount of necrosis and a few drops of pus. These escape in the direction of least resistance, which is toward the surface.

If the same organism invades the loose subcutaneous areolar tissue, conditions are more favorable for the spread of infection, and there is more suppuration and

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a larger necrotic mass. In order to escape, the products of inflammation must penetrate the entire thickness of the skin, and in doing this they follow paths of diminished resistance furnished by the arrectores pilorum muscles, the sweat and sebaceous glands, and the hair follicles. This gives rise to the cribriform openings characteristic of carbuncle.

The difference between boils and carbuncles is size, and this depends on the physical characteristics of the tissue involved. Tissue density is not the only factor. Constitutional states, like diabetes, have their influence on the course of inflammation, but other things being equal, the more compact the tissue, the greater the resistance to extension of infection.

We can render the tissue surrounding a focus of infection more compact by making use of the contractile property of collodion.

The following technic is recommended: The collodion must be contractile, i.e. collodion U. S. P. Flexible collodion will not do. The skin should be shaved. If an ointment has been previously used, this must be removed. Gasoline is satisfactory for this purpose. In any case, the final cleaning of the skin should be with alcohol or ether, or preferably both. The collodion is painted in a thick circular band around and on the boil, leaving an opening where it seems to be pointing; or where it is desirable that it should discharge. It is necessary that the band be wide enough to extend beyond all inflamed tissue. It is best that the middle of the band be made thick and tapered toward the periphery and toward the central opening. The collodion is applied by about ten to twenty circular strokes with a saturated swab, so as to build up a thick layer. The completed dressing resembles a thin bunion plaster in shape. The size varies from 1½ in. with a ¼ in. opening for a small boil to 6 or 8 in. with an opening an inch or more in diameter in a carbuncle.

As the collodion dries, certain interesting things happen. The pain is relieved immediately, within thirty seconds, and does not recur.

Wrinkles appear in the collodion and extend out on the surrounding skin, showing that the tissue is being pulled together. A profile view shows that there is a considerable projection of tissue through the central opening. If a bunion plaster were placed on the mammary gland so that the nipple projected through the opening, it would give an idea of the appearance. When this protrusion of tissue takes place it shows that the procedure has been properly carried out. After the collodion dries it is covered by a light gauze dressing large enough so that it can be secured by adhesive plaster strips placed well outside the edge of the collodion. In twenty-four to forty-eight hours this central projection breaks down and the slough is discharged, leaving a relatively small cavity.

In the case of a carbuncle the relief of pain is not so prompt and complete, but it is always considerable. It may take a week or more for the slough to be discharged.

In either a boil or carbuncle there is generally such a marked change in a few hours as to suggest that compression of the tissue results in concentration of the contained antibodies (but this is pure speculation).

If the collodion ring becomes loose before the slough has been discharged, the loose portion may be trimmed away and the dressing reinforced by more collodion, or if necessary an entire new application may be made. This should be avoided as much as possible, as repeated applications tend to set up a superficial dermatitis. When two or more boils are close together it is better to surround the group with a single band of collodion.

If a boil is located near the edge of the lip it is not possible to surround it with the collodion circle, but in this case a half circle or horseshoe band is applied. In two of the dangerous upper lip furuncles

the infection did not extend after this procedure was adopted.

There are certain limitations to the usefulness of this method. Boils and carbuncles are usually situated on extensor surfaces where contraction of the skin will exert compression, but if the skin is loose and the contour of the part is concave, as in the axilla, contraction of the collodion will result in gathering the skin together like a purse-string ligature.

In a small series of carefully measured applications the contraction of collodion was found to be quite uniform. The average contraction was 18 per cent in one hour and 27 per cent in four hours. The extremes were 22 per cent and 32 per cent. After four hours there was very little further contraction.

The advantages claimed are:

1. Prompt relief of pain.
2. There is no incision, consequently no infection of tissue previously uninfected.
3. The surrounding skin is protected so that the primary focus is not surrounded by a secondary crop.
4. The slough is discharged promptly and healing is accelerated.
5. It is not incompatible with other methods of treatment.

HOW TO REMOVE OCULAR FOREIGN BODIES*

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THE complaint of "something in my eye" is one that each and everyone of us should appreciate, especially if at some time we have been the victim.

To know one's limitations in a particular subject is better than to "take a chance." The experience gained after treating several thousand of these cases is worth while.

After ascertaining in a brief statement, what happened, place the patient in a chair, with the head rest properly adjusted, or, lacking a head rest, place the chair so that the patient's head rests against the wall. In some cases it is better to have the patient lie on the examining table.

If there is considerable eyelid spasm, which interferes with the proper examination of the eye, instil a drop of some local anesthetic, such as holocaine 1 per cent, or butyn 2 per cent, or cocaine hydrochloride 4 per cent. (Remember that cocaine dilates the pupil and causes a drying of the corneal surface.) This is done by telling the patient to "look up," at the same time pulling the lower eyelid down with the index finger or thumb of the left hand, by pressing on the skin at the lower edge of the orbit. Instil the anesthetic on the conjunctiva of the lower lid and not on the ball of the eye. This instillation may be repeated, if necessary, at intervals of three minutes, for three doses.

Have a beam of light focused on the eye which you are examining, from a lamp with adjustable goose neck, either attached to the wall or on a floor stand (Fig. 1), placed on the right side of the operator if right handed, and on the left, if left handed. Evert the lower eyelid in the same manner as when the drops were instilled, look at the conjunctiva and give special attention to the lacrymal puncta of the lower eyelid, as it may contain an eyelash or a piece of hair (seen frequently in barbers or after a hair cut). Note whether any of the eyelashes are turned in, rubbing the eyeball. If it is a foreign body, wipe it off with a tooth pick whose end has been wrapped with cotton. If there is a piece of hair in the puncta, remove it with a pair

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of small tissue forceps. Turned in eyelashes are to be pulled out.

To inspect the conjunctival surface of

Fig. 1.

the upper eyelid, grasp the eyelashes with the index finger and thumb of the left hand, tell the patient to "look down" and turn it on a cotton wrapped toothpick, at the wrinkle in the skin, which is about ¼ in. back of the edge of the eyelid and which indicates the edge of the tarsal plate. Do not fail to inspect the conjunctiva in the retrotarsal fold which is above the edge of the tarsal plate, by pushing the lower eyelid upward and against the ball of the eye, causing the conjunctiva to come into view. If a foreign body is seen, remove it with a cotton-wrapped applicator.

Direct the patient to apply compresses of cool boric acid solution every three to four hours, for five minutes until the redness and discomfort disappears. If the foreign body has been in the eye for a day or two, there will be some excess mucus or mucopurulent secretion. If so, follow each series of compresses with some antiseptic, such as solution of argyrol 20 per cent (freshly made) or solution of mercurochrome 1:500.

Fig. 2.

If after a careful examination of the conjunctival surface of the eyelids and the lacrymal puncta, inspect the cornea.

Take a magnifying lens in the left hand, between the index finger and thumb, using the other fingers to hold up the upper eyelid and focus a ray of light on the cornea. Examine to see if there is a foreign body present. If one is located, instil one of the anesthetics mentioned and then try to remove the particle with a cotton-wrapped applicator held in the right hand. Direct the patient to keep both eyes open and to look at some object or point so as to keep the eyes steady. Failing to remove the object with the cotton-wrapped applicator, use a blunt eye spud, previously sterilized, and have the blade of the spud nearly parallel with the surface of the cornea. If the foreign body has gone into the eye hot, as from the exhaust of an auto, or from the friction of the tires on the pavement or from an emery wheel, it will leave a dark ring or escar, which should be removed. This is best accomplished with a foreign body needle, trying to get under or behind it, care being taken not to perforate the cornea, by digging too deeply. The combination of blunt and sharp edged spud can be secured in a universal holder and made of rustless steel (Fig. 2).

After a foreign body has been removed from the cornea, with a cotton-tipped applicator, instruct the patient to use warm applications of boric acid solution every four hours, for five minutes. If the cornea has been badly damaged and the patient is a young person, instil 1 drop of solution atropine sulphate 1 per cent. Be sure to tell the patient that "the

drop will make the pupil large and that the vision will be blurred for a few days."

If an elderly person, with much damage to the cornea, and in whom the use of homatropine or atropine solution might cause glaucoma, it is better to prescribe solution pilocarpine hydrochloride 1 per cent, to be used every three hours, to put the iris at rest.

Treatment with the warm application, and the solutions if necessary, should be continued until all congestion of the conjunctiva has disappeared. It is good plan, unless the foreign body has been wiped off with the cotton-tipped applicator, to have the patient place about ½ inch of ointment of yellow oxide of mercury, 1 per cent, dispensed in a tube, on the lower lid conjunctiva, after everting the lid, then close the eye and gently massage the eye-ball. The ointment should be applied before retiring.

Cocaine solution, as an anesthetic, should be avoided, especially in a person past forty years of age, because it causes dilation of the pupil and might bring on an attack of glaucoma is one susceptible to this disease.

If, after a careful examination has been made, no foreign body has been found, instil a drop of 1:500 solution of mercurochrome and wash out the excess with a small amount of boric acid solution. Then examine the cornea with a ray of light, focused with the condensing lens. A red spot indicates that the conjunctival or first layer of the cornea has been abraded and the treatment indicated is the same as when a foreign body has been removed from the cornea.

The use of smoked glasses give relief from the lacrymation and photophobia caused by bright light or sunlight.

The value of placing a dressing and bandage or the use of a black patch to cover the injured eye, instead of the dark glasses, may be determined by the amount of injury of the cornea, the distance that the injured person might have to travel in inclement weather and the general mentality of the patient and the condition of his surroundings. The laborer in the foundry or the steel mill will do better if his eye is covered between treatments to prevent contamination by dirty fingers or soiled handkerchiefs.

In young children it is sometimes possible to remove foreign bodies from the upper and lower eyelids, without much difficulty, but in case the foreign body is imbedded in the cornea, it is safer to administer a general anesthetic than to risk further damage or perforation of the cornea, in attempting the removal in a nervous, frightened and uncontrollable child.

The essentials for the successful removal of foreign bodies from the human eye may be summed up as: (1) a comfortable position for the patient's head; (2) sufficient anesthesia to render the eye insensable to pain; (3) a good beam of light on the injured eye; (4) good vision in the operator's eyes; (5) the proper sterilized instruments, and a knowledge of what to do and how to do it.

SUBCUTANEOUS FOREIGN BODIES IN MINOR SURGERY*

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A VERY considerable number of all patients who apply for emergency treatment are victims of foreign bodies. While the injury itself may not be immediately serious we find altogether too often ill-advised emergency treatment administered. Sound judgment and application of fundamental principles of surgery are most important in handling this type of practice if we are to avoid aggravating the pathology already present.

Foreign bodies may be roughly classified into: (a) foreign bodies containing sufficient mineral matter to cast an *x*-ray shadow, such as steel, certain types of glass, stones, etc.; (b) those foreign bodies which do not usually contain sufficient mineral matter to cast a shadow, such as splinters and vegetable matter.

A. FOREIGN BODIES IN THE SKIN AND SUBCUTANEOUS TISSUES

In general this foreign material should be removed at the earliest possible moment after its introduction into the tissues. Certain dicta might be outlined:

1. Always study the line of transit of the foreign body through the tissues and localize the foreign body with intelligent use of the *x*-ray and fluoroscope when possible. Accurate localization of a foreign body facilitates in its removal.

2. Operative removal often demands considerable dexterity and ingenuity. The search and removal of the foreign body must be done with the very minimum of trauma, bearing in mind that operation often further disseminates the potential infection that lurks in *all* accidental wounds.

3. The approach to a localized foreign body is usually facilitated by making the exploratory incision at right angles to the long axis of the foreign body.

4. An Esmarch's bandage applied to an extremity gives a bloodless field and far better visibility in dealing with foreign bodies or infections.

5. If a foreign body is small and deeply situated and causing no loss of function, operation is inadvisable as its removal would probably do more harm than good.

6. When the tract of a thorn or splinter is subcutaneous, it is often advisable to open up the tract throughout.

7. Blind search for a suspected splinter is usually non-productive and meddlesome surgery.

8. Removal of powder burns, dirt, sand, etc. Early removal of every particle of such insoluble foreign material is imperative if we are to avoid having them covered over by epithelium. Neglect of early adequate treatment is these cases often leaves permanent areas of discoloration in the skin similar to tatoo marks. Powder grains are so soft and numerous that it is hopeless to pick them out one by one. A thorough scrubbing (under a general anesthetic) with a stiff brush until every trace of the powder and dirt is scraped away is probably the best assurance of a satisfactory cosmetic result.

9. Foreign bodies which remain in the tissues by intent or oversight become encysted in inflammatory reactive processes, i.e., scar tissue. These encapsulated foreign bodies may at any time be the seat of an inflammatory focus which eventually leads to their removal. In other instances the foreign body implantation is associated with pyogenic infection. In the latter instance there is a resulting sinus which closes only when the foreign body is extruded spontaneously or removed.

10. A satisfactory postoperative treatment of these wounds would be that

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applicable to infected wounds in general until they are proved otherwise. Accordingly it would seem rational therapy to order rest, immobilization, sterile compresses, etc. For practical purposes an alcohol and glycerine compress affords an excellent dressing for these wounds.

11. These wounds are often in the nature of puncture wounds and hence are potential seats for anerobic cultures. Therefore we always consider and anticipate the possibility of gas or tetanus infection in each individual case. In such instances the prophylatic serum is always indicated.

STRICTURE OF THE URETHRA*

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TRUE stricture of the urethra is a cicatrix of the urethral wall left there by some injury or inflammation, and manifesting a constant tendency to contract, and thus to diminish the lumen of the urethra. This tendency to contraction, which is always manifested in a greater or less degree, is doubtless caused by the irritation incident to micturition; the impact of the stream against the barrier, for the deepest stricture, the one which most obstructs the flow of the urine, is almost always the tightest and if the stricture is kept dilated so as to afford little or no obstruction, the tendency to recontraction is slight.

Stricture occurs in the female as well as in the male urethra. But this lesion in the female is much less common, and manifests no distinguishing peculiarities.

Several classifications of strictures have been offered, but one I like best is to class them as inflammatory, traumatic and inflammatory strictures which have been operated and thereby have had true scar tissue added to them. About 90 per cent of all strictures of the urethra are due to inflammatory causes; 10 per cent are of traumatic origin. Inflammatory strictures are usually multiple, the deepest being always the narrowest. Sixty per cent of all gonorrheal strictures occur in the deep urethra. We find that 64 per cent of all strictures of the male urethra occur in this portion of the canal.

The formation of inflammatory stricture is of long duration and is an interesting process. The patient contracts the gonorrhea which becomes chronic. After a number of relapses from a chronic to the subacute stage, the tissues become accustomed to the presence and growth of the gonococcus, that they react to its presence only by the formation of a round-celled infiltration of the urethral wall. As the round-celled infiltration progresses the urethral wall becomes thickened, loses its elasticity, the canal is narrowed, and we have the formation of a mass which has been given the name of stricture. In the majority of these cases the mass is palpable. As this process becomes older, connective tissue cells appear in the older portions and the mass undergoes organization, that is, it becomes converted into fibrous connective tissue. This has the nature of all newly formed fibrous tissue and as it reaches maturity it shrinks. This shrinking causes permanent loss of elasticity in the walls of the canal and partial or total obliteration of the canal itself. The thickening in the urethra is not entirely due to organized tissue, but to the completely and partially organized tissue, to which is added an area of greater or less extent of inflammatory exudate.

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When we study traumatic stricture we find an entirely different process. Here we have tissue loss in the urethral wall. We have the space filled first, with blood clot, then with an exudate which becomes organized into fibrous tissue which shrinks. In this way it distorts and obliterates the canal. In this case, however, there is no thickening of the tissues. A scar which binds two torn tissues together is never as thick as the tissue it joins. In the urethra where scar tissue replaces lost portions, the wall is thin instead of thickened. Only occasionally is there an area of chronic inflammation surrounding the lesion, so that in the majority of cases traumatic stricture is not palpable. Those cases which are palpable belong to a class of inflamatory strictures which have been operated on and we have the combination of inflammatory and traumatic stricture.

If we compare sections made from inflammatory stricture and traumatic stricture under the microscope we find they are alike, with the exception that in the tissues of inflammatory stricture are found small foci or islands of lymphocytes. These are more numerous in the newer tissue and finally entirely disappear from the old tissue. Microscopically these tissues are said to be identical, clinically, inflammatory stricture and traumatic stricture differ very much. This difference not being in the symptoms they produce or the length of time which they require for their formation, but in the fact that one permits of cure by dilatation while the other does not.

Dilatation is the accepted method of treatment of urethral stricture today. But indulged in carelessly it has fallen into disuse since it only adds to our troubles. Torn tissues always heal by the addition of scar. Dilatation can be performed in two ways, either by temporary or continuous pressure. The temporary method, that is the passage of a bougie or sound which is allowed to remain for a few seconds to a few minutes, is applicable to a stricture of large caliber. The continuous method, where the bougie is allowed to remain for a number of hours or days, is suited to use in very narrow strictures of the deep urethra.

If a case comes to us with a dribbling or a retention and we are able to pass a filiform bougie through the stricture, this bougie should not be removed but should be fastened in such a manner that it can neither come out of the urethra nor pass into the bladder. If the bougie has apparently gone through the stricture and we are uncertain that it has followed the urethra, a rotation of the instrument, provided the proximal end of the bougie is in the urethra, will give the patient a sensation of urination and we are then certain that the bougie is within the urethra. At the end of twenty-four hours, or at the most forty-eight hours, we should be able to pass another bougie beside the first, and within the next day we should be able to pass a third. These can be allowed to remain several days longer, at which time we should be able to pass larger bougies without trouble.

In treating all strictures of the urethra one cannot tell just what portion of the inflammatory urethral obstruction is caused by organized tissue, cellular infiltration, or inflammatory exudate. We must add to our mechanical treatments those methods which seem best to relieve inflammatory conditions. Hot applications are the best for the relief of inflammation, and they are particularly valuable in the inflammations in and about the pelvis. This is true both of the female and male patient. We, therefore, add to our mechanical treatment, hot sitz baths, two per day. After enough absorption has taken place in the urethra so that a No. 10 F. or 12 F. bougie can be passed without difficulty the patient may be treated by temporary dilatation, that is by the passage of a sound or bougie every seven days. The sitz bath, however, should be kept up for three or four weeks. By this method we are able to pass a number 10 F. bougie in about a week, and in ten to fourteen days the patient

can be allowed to return to his ordinary vocation.

This method of treatment as described is applicable to inflammatory stricture because the newly formed fibrous tissue of inflammatory origin will absorb or become thinned down and stretched out to give the urethra its full caliber. Whether this is due to absorption and stretching a fibrous tissue, or to the absorption of the round-celled infiltration and inflammatory exudate in the mass, I am unable to say. This same treatment if applied to traumatic stricture is practically without results. The fibrous tissue of true scar tissue does not admit of absorption or of stretching so as to restore the caliber of the canal.

Attempts at stretching traumatic stricture have proved absolutely futile. I am of the opinion that practically all traumatic strictures must be operated upon, and that the more quickly we give our patient this advice, the more quickly we have him on his way to recovery.

In strictures of the third class, that is, those inflammatory strictures which have been operated upon and which have not received the proper after-care but have been allowed to recontract, the proposition is somewhat different. Here we have an inflammatory tissue which we can absorb and scar tissue which we cannot remove by mechanical means. We have, however, no way of knowing the proportion in which these two conditions exist, therefore, we are justified in these cases in attempting a cure by dilatation, which we may have to lay aside after a few weeks and advise operation.

ELECTROSURGICAL GYNECOLOGICAL OFFICE PROCEDURES*

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Electrosurgery, the incision, removal, or destruction of tissue by means of a high frequency electric current has simplified and rendered more efficient many surgical procedures. This is true in minor and major general surgery and gynecology.

Many gynecological patients require minor operations, so little incapacitating that they are reticent to entering a hospital. Before the advent of electrosurgery, hospitalization was practically a necessity because of the technical difficulties encountered in handling bleeding incisions without an assistant and hemostats. Many patients object to hospitalization for such so-called minor conditions, others being unable to leave their home or vocational duties.

Electrosurgery has made it possible to perform many of these minor gynecological operations in the office as there is little or no bleeding; the operations are technically easier; they are done under local anesthesia; healing is prompt and painless with soft pliable scars; and small malignant or potentially malignant lesions are removed completely with less danger of metastasis.

1. *Urethral Caruncle and Redundant Urethral Mucosa.* True caruncle is not as common as usually supposed. The marked tenderness of urethral caruncle is so constant as to be almost pathognomonic of the disease. Redundant mucosa is practically painless and, being more common then caruncle, is frequently mistaken for it.

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In treating either condition a local injection of 1 per cent or 2 per cent novocaine is first made inclosing a wide margin beyond the disease, frequently requiring injection all way around the urethral orifice. The caruncle is excised with a strong cutting-coagulating current. Healing is prompt after the film of destroyed tissue comes away in about a week. There is usually little pain.

Redundant mucosa is quickly destroyed by applying the monoterminal heating current directly to the surface using a sharp needle electrode. If the tumor is very thick the needle should pierce the tissue to the necessary depth.

Corbus and O'Conor[1] describe a unique method of treatment claiming that by using their technic there is little possibility of stricturing. I have never seen stricture following the usual destruction with the current.

A thin, flat electrode, ½ inch long and ⅛ inch wide, is placed in direct contact with the mucosa. A slow, biterminal current is preferred as the entire depth of the mucosa should be destroyed. The electrode is reapplied to three equidistant portions of the lumen. No shrinking is immediately appreciable, the bulging meatus showing four grayish-white lines of desiccation with normal mucosa between. Sloughing of desiccated areas takes place in a few days, symmetrical contraction of the scar tissue literally pulling the meatus and surrounding mucosa inward. If the desiccation has been done transversely with the urethral wall no actual contraction of the lumen results.

2. *Venereal Warts.* Local anesthesia is necessary here. The warts dry up quickly under the application of a monoterminal desiccating current. Heating is prompt and without notable discomfort. When the warts are thick or piled up closely together, making a bulky dehydrated mass after treatment, they are removed with a curet, the base being re-dried with the current. Small warts after being treated are allowed to remain until they separate spontaneously allowing healing processes to continue beneath them.

3. *Cysts.* Bartholin's glands cysts are opened with the cutting current with very little or no bleeding. After evacuation of the contents the epithelial lining is destroyed with a desiccating current and the wound allowed to granulate after the destroyed tissue has sloughed. In large cysts frequent packing with iodoform gauze is helpful in keeping the wound clean, stimulating healthy granulations.

4. *Infections in Skene's and Bartholin's glands* causing recurrent infections in the urethra and cervix are frequently obstinate to usual treatment. The glands are easily sterilized by the method of Corbus and O'Conor. A long, thin needle is inserted to the depth of the gland, the current turned on and continued until the tissues adjacent are blanched, indicating dehydration. The dehydrating current produces sufficient heat to sterilize the infection. Healing is prompt and complete.

5. *Endocervicitis.* Chronic endocervicitis is a very common gynecological condition quite resistant to the usual chemical method of treatment. The large edematous cervices with many large cysts filled with mucopurulent material require thorough cauterization, destroying the deep-seated organisms buried in the long racimose glands. Such treatment should be thorough and extend up to the internal os. Except in a few patients where general anesthesia is contraindicated, there large edematous cystic cervices should be treated under general anesthesia. In the more mild cases the canal and external os is cleaned up with a biterminal current under local anesthesia. The current should be of comparatively low voltage and high amperage. Too high voltage will cause the current to penetrate far out into the tissues beyond the area of anesthesia giving pain. A short thick spark will destroy the mucosa and glands deeply enough to sterilize without

[1] Corbus, and O'Coner, Diathermy in the Treatment of Genito-urinary Disease. Bruce Pub. Co., 1929.

general anesthetic. If desirable, the treatment may be done at several sittings.

6. *Polyps.* Small vaginal or cervical polyps are readily destroyed with a short, thick monoterminal current. Pedunculated ones should be grasped in a clamp and the pedicle severed with a cutting current. Very little bleeding occurs, prompt healing being the rule.

7. *Hemorrhoids.* Much has been written recently about the destruction of hemorrhoids with electrosurgical currents. Suffice it to describe here those which are most readily treated in the office. It should be noted in passing that large internal and external hemorrhoids can be dehydrated (desiccated) under local anesthesia in the office. Extensive cases should be dealt with in the hospital but there are many patients having small enlarged hemorrhoidal veins which can be relieved by electrosurgery under local anesthesia. Especially is this true with patients who cannot conveniently leave their occupation for hospitalization. Ordinarily one treatment is sufficient but more than one sitting may be necessary when several hemorrhoids exist.

One or two hemorrhoids require only local injection about them whereas multiple ones necessitate injections around the anus and up above the internal sphincter. The sphincter muscle is then dilated, releasing the spasm, which causes the hemorrhoid. A desiccating monoterminal current of short, thick spark is perferable being applied by a suitable needle electrode. The needle is thrust into the hemorrhoid and allowed to remain until the blood is dehydrated sufficiently by clot. There is, also, a small area of whitening around the point of insertion. William L. Clark advises no further treatment but Kelly and I feel that it safeguards against possible infection by incising the vein wall for subsequent drainage. The clot may be vaccinated if desired.

Larger hemorrhoids require clamping with any suitable hemostat stagnating the blood rendering dehydration and clotting more prompt. When the clamp is removed no hemorrhage occurs.

Healing is usually complete in two to three weeks with little scarring or pain. Occasionally pain does occur being readily controlled with mild sedative suppositories or instillations of sedative solutions.

INJECTION TREATMENT OF VARICOSE VEINS*

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THAT veins could be obliterated by the injection of sclerosing solution into their lumen has been known for a long time. Many physicians have noticed this phenomenon, always with more or less fear and trepidation, in the therapeutic administration of drugs intravenously for other purposes. However, until the past few years it was thought to be unscientific, in fact foolhardy, to introduce a solution into a vein with the intent purpose of forming a thrombus. The possibility of the occurrence of a pulmonary embolus seemed to be too great to give this a second thought as a therapeutic measure. Yet McPheeters and Rice in reviewing 53,000 cases of varicose veins treated by the injection of sclerosing solutions into their lumen found only 4 authentic cases of pulmonary embolus. These same men have shown by injecting lipiodol into varicose veins of the lower extremity and observing the direction of flow under the fluoroscope, that the flow is toward the periphery in the superficial varicose veins and not toward the

* From The Mason Clinic, Seattle, Wash. Submitted for publication December 10, 1929.

heart, as we might expect. This is due to a dilatation and incompetency of the valves of the saphenous system, and as a result the blood stagnates in the lower portion of the leg. If an embolus is formed it will travel toward the periphery and lodge in one of the branches of the vein rather than proceed through the heart to the lungs.

CONTRAINDICATIONS

As more has been learned of the injection method of treatment the contraindications, which were at first thought to be numerous, are now recognized to be few indeed. Where there is a definite etiological factor present this should be corrected first, if possible, before we can expect progress very far with the treatment of the varicosities already present. With the etiological factor removed we can then proceed with the injection, knowing that new varicosities will not be formed as soon as those present are obliterated. We believe that this method is contraindicated in definite cases of cardiorenal disease and in the aged and decrepit. A further contraindication is the presence of a superficial infection of the veins of the leg and again a history or evidence of a preceding thrombophlebitis of the veins of the deep system.

SOLUTIONS

The solutions used for producing the sclerosing effect on the vein wall have been numerous. Our experience has been limited chiefly to the sodium salicylate in 20, 30, and occasionally 40 per cent and to the invert sugar in 60 and 75 per cent strength. The sodium salicylate requires greater skill on the part of the operator and a more exacting technic, for if any of this solution is deposited extravenously it will not only cause severe burning pain to the patient but will also produce a slough of the injected tissues. It has the further disadvantage of causing a very intense cramp-like pain at the time of injection lasting from one to three minutes, which occasionally is so severe as to cause the patient to cry out in agony. However, the salicylate is extremely effective in obliterating the vein and superior to the invert sugar in this respect. On the other hand the invert sugar will not produce a slough if only a few drops are deposited extravenously but will cause a periphlebitis which, while painful, is not alarming. It generally causes a mild cramp at the time of injection, but this is not to be compared with the agonizing cramp from the salicylate. However, the invert sugar solution will sometimes have to be used two and even three times in the same vein (the large leathery type) particularly if the technic has been such that the solution has been injected into a vein partly filled with blood, thus causing a dilution and loss of effectiveness.

EQUIPMENT

The equipment necessary for the injection is simple. It consists of (1) the sclerosing solution to be used, which can be obtained in ampules; (2) a 10 c.c. Luer Lok syringe; (3) a large long needle used only for filling the syringe with the solution; (4) a fine, sharp-pointed, short-beveled needle for entering the vein; (5) rubber tube tourniquets, and (6) ordinary gauze bandage, adhesive tape, cotton and alcohol.

The aim and object of the operation is to inject the solution into the lumen of the vein in sufficient concentration to cause a definite thrombophlebitis, eventually resulting in organization and obliteration of the vein. It is also our object not to interfere with the circulation in the deep veins. Our technic has been devised with these objects in view.

The patient is asked to remove all clothing from the lower extremity. We then have him stand in the step of an ordinary examining table. This causes the varices to be distended and dilated so that they can be entered easily. Having previously filled the syringe we change the needle so that the needle we now use has none of the solution on its outside, as

this would be sufficient to cause irritation along the line of puncture. We then place a tourniquet about 3 inches below the site selected for the injection, making it tight enough to shut off only the superficial veins. Using the strictest aseptic technic we enter the vein. After we are sure that the point of the needle has entered the vein we push the point forward in the direction of the course of the vein for a distance of ¼ to ⅜ inch. If this is done a slight movement on the part of the patient or a slight shakiness on the part of the operator can not cause the needle to slip out of the vein. With the needle still in the vein's lumen and before any injection is started we have the patient lie down in the horizontal position. While the operator holds the syringe with the needle in the vein an assistant carefully raises the leg to about 2 feet above the horizontal. The vein will then empty itself of blood by gravity and collapse. With the leg still in this position a second tourniquet is placed around the leg about 3 inches above the site of injection, care being taken to shut off only the superficial veins. The vein is now collapsed and segmented by tourniquets above and below. We then aspirate to make sure that the needle has not slipped out of the vein during the manipulation of the leg. If we are still within the lumen we begin injection. The injection can proceed as rapidly as is expedient, but one thing is absolutely essential, i.e. that we be sure that we are within the vein at all times during the injection. The amount injected into each vein varies with the size of that particular vein. We usually inject sufficient solution to cause a moderate distention of that vein, whether it be 5, 10, 15 or 20 c.c. When the injection has ceased we do not immediately remove the needle from the vein but allow it to remain in situ for from three to five minutes while the sclerosing solution is exerting its effect. The tourniquet can then be released and the needle withdrawn and pressure applied directly over the needle puncture. This will prevent leaking of the fluid into the tissues. We may inject two or three veins on each leg with the sugar solution at each sitting, but it is not believed wise to inject more than two veins at one time with the salicylate.

As to the frequency of injections it is probably best to wait about ten days between treatment. This will allow time to observe the effects of the previous injection and we are then better able to judge the necessity for further injections. In less time than this we will be unable to tell what veins have been sufficiently affected by the solution to be obliterated. A good injection into a large varix will frequently obliterate most of the smaller tributary varices in this segment, thus obviating the necessity of injecting them separately.

Some operators have felt hesitant about injecting the saphenous vein high up in the thigh, contending that embolus is more apt to be dislodged in this region. In view of the before-mentioned work of McPheeters and Rice, this does not seem to be a logical contention and the saphenous vein can be injected close to the femoral opening with as much assurance of safety as elsewhere in the leg.

After a proper injection there will be slight inflammation and redness along the course of the vein. This will cause some inconvenience to the patient for two or three days but nothing more. If any of the solution is deposited extravenously a severe periphlebitis and paraphlebitis will occur, and if much is deposited a slough will be produced. At the end of two weeks the vein can be felt as a fibrous cord running up the leg. However, organization will not be complete for from sixty to ninety days.

RECURRENCE

Many patients ask the question, "Doctor, will these come back?" We can tell these patients with a fair degree of assurance that the ones injected and obliterated will not come back. However, we must explain that the mere injection and obliteration of the veins already present will not

prevent the formation of new ones and there will be the same tendency to form new ones as there was to form the original ones. For this reason the patient should report for observation at least once a year after he has been discharged, at which time all newly formed varices can be taken care of at one sitting.

TREATMENT OF FRACTURES OF FINGERS AND TOES*

C. R. G. Forrester, M.D., and Dan R. McLean, M.D.

CHICAGO

As the anatomical characteristics of the bony structures about the toes are for all practical purposes the same as the fingers a single classification of the types can be made. From a functional as well as a cosmetic standpoint, however, the treatment of the finger fracture is more important than the toe fracture. We will write of all of the injuries as fractures of the fingers but the same treatment can be applied to like fractures of the toes.

The fingers as well as the toes consist of three phalanges with their attached and associated muscles, tendons and joints, with the exception of the thumb (analogous to great toe) which consists of only two phalanges and whose function is more highly specialized than the rest of those small structures. The most simple as well as general classification of the fractures is as follows:

1. Chipping and comminuted fractures of the spongy portion of the distal phalanx.
2. Transverse fractures of the shaft.
3. Spiral fractures of the shaft.
4. T-fractures into the joint.
5. Tearing loose of the tendon insertions.

Any of these types can be compound rather than simple.

Practically all fractures are treated in our office under local anesthesia, using the technic taught by Prof. Lorenz Boehler of Vienna. This consists of the painting of the skin over the site of fracture with iodine followed by alcohol. A sterile needle is then introduced between the fragmented bone, care being used to get this into the hematoma produced at the time of injury. Then about 5 c.c. of 2 per cent novocaine without adrenalin are injected through this needle directly into the hematoma, which is in this way the carrying agent as well as the dispersing of the anesthetic. After a short interval of time (depending on the age of the fracture) manipulation can be carried on painlessly. In compound wounds the injection should be made on the opposite side of the compound wound and a through debridement of the wound with closure of the skin made. Fracture of the digits can also be done under a nerve-block anesthesia of the lateral nerves but we have found the direct local to be the simplest as well as the most efficacious.

Chipping and comminuted fractures of the spongy portion of the distal phalanx are usually associated with some hemorrhage under the finger nail. In order to relieve the tension and pain caused by this condition the nail is opened widely to permit of drainage (no anesthesia is used); the fragments are moulded into good position by direct pressure, and a small tongue depressor splint, from the proximal interphalangeal joint, so that it projects well over the tip of the finger, is bandaged in place. The bandage can be changed as necessary with the splint allowed to remain in place about three weeks and the patient allowed to use his finger. He may be discharged in one month.

Fractures of the middle of the shaft of the distal phalanx are associated with

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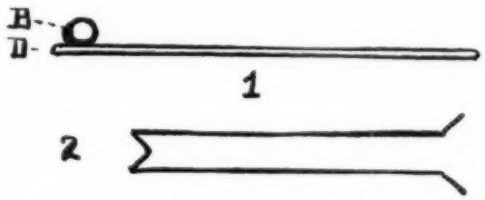
some displacement but not with the deformity due to muscle pull. These fractures can be injected with the local anesthetic, a primary reduction by manipulation and traction and a small tongue depressor splint applied on the flexor surface so that it immobilizes the distal interphalangeal joint.

In traumatic work we often come in contact with a case which has received either a direct blow, a forcible flexion or extension of the distal phalanx. These cases show an immediate droop of the distal phalanx into flexion. The *x*-ray will reveal a small chip fracture of the proximal end of the distal phalanx at the insertion of the extensor tendon. The end-result in these cases, in practically all instances, is permanent deformity of the distal interphangeal joint with some loss in extension. Occasionally by moulding and counter-pressure over this area together with a palmar splint along the whole of the finger, the detached piece can be replaced. It is usually well to put a piece of hard roller bandage on the distal end of the splint and by adhesive hold the distal phalanx in shape extention as shown in Fig. 1.

The splint in this condition, however, must be allowed to remain in place about four weeks and one should not be suprised if the flexion deformity recurs on its removal. We have practically never opened up one of these cases to tack the tendinous insertion in place.

T-fractures into the joint can all be very effectively and practically reduced under local anesthesia. Small appropriate splints are used to hold them in place, keeping in mind, however, the value of early motion for restoration of function. In our practice we begin this passive motion in ten to fourteen days and replace the splint until about the seventeenth to twenty-first day. These fractures are associated with somewhat longer disabilities and as an end-result some slight impairment in motion due to intra-articular deposition of callus is likely.

Spiral and oblique fractures of the shaft, either of the middle or proximal phalanx, are associated with deformity and shortening due to muscle pull. They are very



Figs. 1. and 2. B, bandage. D, depressor.

difficult to hold in position after their reduction, which is always done under a local anesthesia. A glue is made of acetone and celluloid so it is of a fairly thick consistency, and by means of this we are able to attach bandage to the finger for traction. A plaster collar is put on over the wrist and in which we incorporate one strand of piano wire bent as shown in Figure 2. By means of heavy rubber bands attached to the plaster and which can be twisted to make traction, the fragments can be held in excellent position and alignment. The whole is covered with a bandage and allowed to remain in place for a period of three weeks when removed. Active and passive movements with heat and massage instituted, recovery takes place in six weeks with small functional impairment aside from the bony thickening at the site of injury.

Fractures of the proximal or base phalanx, whether treated by traction as given here, or any other method, are all held in retentive apparatus in some degree of flexion at the metacarpophalangeal joint due to the anatomical attachment of the muscles. The lumbricales are inserted at the proximal end of the middle phalanx, hence when the finger is dorsal to the midline they extend the middle phalanx on its corresponding proximal phalanx, and when the phalanx is ventral to the midline they act as flexors of it. The interossei, however, at their attachment at the proximal end of the base phalanx always act as flexors of this phalanx. Therefore any fracture distal

to the insertion of the interossei and proximal interphalangeal joint is associated with palmar angulation at the site of fracture. By dressing this type of injury in flexion we relax the interossei muscles and thus relieve our oppositive action. After anesthetizing these fractures with our local anesthetic, acutely flexing the proximal phalanx, we are often able to obtain a 100 per cent result without the use of traction. They can then be dressed over a roll of bandage in the palm of the hand for three weeks, when they should be released and active and passive motion started. Recovery is usually complete after six weeks from date of injury.

The writers appreciate the fact that there are many important features of these cases which they have not dealt with completely in the small space allotted

SIMPLE BALANITIS*

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Having made the diagnosis of simple balanitis, the next step is gently to clean the surface and follow this with some mild antiseptic. One of the most dependable treatments is the constant moist dressing: A thin layer of cotton or one thickness of a gauze bandage is moistened with a mild antiseptic and placed over the glands in a smooth layer and the foreskin replaced. The dressing should be changed several times a day (i.e. at each urination). Thiersch solution,[1] or 1:4000 or 1:8000 bichloride solution are examples of well-tried remedies.

If there has been too long a delay in beginning treatments, the surface may be painted with rivanol 1:1000 or 1:2000, or mercurochrome 2 to 8 per cent followed by a constant moist dressing. After the acute infection has been cured, it is well to follow by dusting once or twice a day with zinc stearate or some bland dusting powder.

If the foreskin cannot be retracted, the glands may be cleansed by using a hand syringe with a suitable nozzle or an irrigator under low pressure and a glass tip that will enter without blocking using a mild permanganate of potassium solution, rivanol or mercurochrome solution 1:1000 or 1:2000.

If there is not a prompt response and the foreskin cannot be retracted, a circumcision should be performed, making a dorsal slit in order thoroughly to disinfect the parts and then finish the circumcision and treat the balanitis openly.

[1] Thiersch powder: 1 part Ac. salicylic
7 parts Ac. boric.
Thiersch solution: Thiersch powder 4.
Aqua 500.

* Submitted for publication November 19, 1929.

DIRTY WOUNDS*

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INTRODUCTION

THIS brief and dogmatic paper is intended to show how fresh dirty wounds should be cleansed and treated in the physician's office, often distant from centers of population and limited in facilities. The writer does not pretend to add any startling improvements to an old subject but simply to emphasize certain methods and rules which have proved valuable in the writer's association and experience with a clinic treating a large number of injured people. It is not within the scope of this paper to exhaust the particular aspects of treatment in wounds of various types or to discuss the abundant literature on the subject.

PRELIMINARY CARE OF THE PATIENT

Reassure the alarmed and wounded patient, gain his confidence, make him as comfortable as possible, remove sufficient clothing to expose the wound freely and allow for proper dressings to be placed. For most wounds, make the patient lie on a dressing table, as he often faints and falls at the sight or pain of a trivial wound under treatment. If the injury is large, painful or serious, if shock, fright, hemorrhage or restlessness is present, quiet the patient with morphine (the Mulford type of tube being convenient for this purpose). Laymen should be excluded from the treatment room as they only handicap operator and patient, and create disturbance. A good nurse is invaluable. Be swift but orderly in your procedure, and take charge of the situation at once. The earlier you start treatment after injury, the better is the result and the less the danger of infection. First then, remember you are treating a whole human being, not simply an isolated wound.

PRELIMINARY CLEANSE

Green soap and warm water serve to cleanse the wounded surface and an adjacent area sufficient to allow for proper treatment and dressing fixation. The scrub must be thorough. A brief foot or hand bath of warm water mixed with green soap and lysol is effective for dirty wounds of extremities; it softens foreign matter so it can be easily removed, also green soap in itself possesses antiseptic qualities.

SHAVE

You can become skillful enough with an old fashioned razor to shave out only the extreme wound edges without inflicting pain, but also a large enough adjacent area to allow dressing fixation and to prevent wound contamination by hair and skin debris. Dry the parts with sterile gauze.

DEBRIDEMENT AND EXPLORATION

This means removal of *all* foreign matter and traumatized tissue from edges and depths of the wound. A tourniquet is seldom necessary but can be used to advantage in a finger injury where blood obscures the field and hampers identification of débris and structures. Aside from obvious dirt and hair, all traumatized or devitalized tissue such as fat and skin fragments must be removed, by extraction, curettage, excision or irrigation. Cut away and shape dirty and rough skin edges to allow neat closure. Identify all structures and layers; if necessary, enlarge the wound for proper exploration débridement and repair. Look for injured bone, vessel, nerve, tendon, muscle and sheath, and after the wound toilet restore the anatomy as nearly as possible. Débridement is essential for prevention of subsequent infection; it must be done gently, quickly and thoroughly. In puncture wounds (espe-

* Submitted for publication November 30, 1929.

cially of feet) cut away the sealed lips of the wound, curette the tract clean of all loose tissue and dirt, cauterize the tract with carbolic acid on a toothpick swab; insert a small braided silk wick. Then tetanus antitoxin will often be unnecessary, provided the wound is dressed the day of injury.

In connection with débridement, to prevent pain (with or without the preliminary morphinization) use 1 per cent or 2 per cent novocaine. Of course, in small contused wounds there is often sufficient numbing of sensation so that the wound can be treated without undue pain or necessity of novocaine. For the other and larger wounds, prepare the surrounding skin with tincture of iodine and alcohol, avoiding the fresh wound itself, then inject novocaine intradermally and subdermally *around* the wound, or use a nerve block anesthesia in an extremity (e.g. finger). The local anesthetic is thus introduced through an undamaged and surgically prepared surface instead of through the dirty wound, which may then be treated painlessly and doused with antiseptic before repair.

CONTROL OF HEMORRHAGE

If bleeding is profuse, control at once by pressure, elevation rest and morphine, by tourniquet, or clamping the "bleeders." Hemorrhage must be controlled at the latest before wound closure, as a hematoma or "wet field" invites infection and delayed or faulty healing; there is also the danger of late or secondary hemorrhage when the patient is out of your reach. Use plain catgut ties or deep skin tension sutures.

DRAINAGE

If slow oozing is expected, use a small drain (silk, silkworm gut, gutta percha or rubber-dam) placed according to the size of the wound to allow dependent drainage from the wound depths for the first thirty-six hours. We use drainage for prevention of infection only when there is delay in starting treatment (two to three hours after injury), or in case of a wound so grossly dirty and traumatized that not all devitalized or foreign matter can be removed without too great sacrifice of tissue. Thirty-six to forty-eight hours tell the story as to whether drains can be removed and healing by first intention expected.

ANTISEPTIC AGENTS

In our experience, thorough cleansing with green soap and water, shave and débridement followed by dousing of the wound with freshly prepared tincture of iodine has given the best results, i.e. the minimum of subsequent infection as compared with the use of other measures and other antiseptics. The few cases of infection following this régime are attributable to excessive trauma and tissue devitalization, excessive dirt, or delay in initiating proper treatment. We have lost faith in the use of acriflavine, mercurochrome, hexylresorcinol and the other widely used weaker antiseptics for any but surface wounds, though we use them for superficial lacerations or abrasions where the painful iodine can be legitimately avoided. In scalp or face wounds, avoid burning the eyes or mucous membranes with strong antiseptics. With compound skull wounds (seldom treated except in hospital) we use great precautions: the whole scalp is shaved, scrubbed with green soap and water, flushed with sterile water, dried, wiped with ether, then prepared with tincture of iodine and alcohol; this procedure is simple, quick and effective. We use a solution of ether and iodoform (ether 59.15 c.c., iodoform 5.53 c.c.) in a compound skull fracture wound, drenching it freely after débridement. The dura when covered by sterile gauze is not harmed by this fluid. Phenol in puncture wounds has been mentioned before.

Dakin's solution is an excellent antiseptic for wound irrigation, when it is freshly and carefully prepared, but can not be available or suitable for most offices. Dichloramine-T in oil is excellent,

if prepared by a good pharmacist; it is stable, suitable for office use, but more applicable to the already infected and deep open wound.

REPAIR

This is mentioned, though somewhat out of the scope of the paper. After wound preparation, each damaged structure is repaired to restore anatomy and function of the part. Use absorbable and interrupted sutures in these dirty wounds which are potentially infected. In tendon or nerve repair, where strength is essential, silk or linen must be chanced and brief drainage allowed. In our clinic we are accustomed to close all wounds after the careful preparation given here; others of you may prefer to drain more often and widely, using secondary closure when infection or its danger is past. Speed, gentleness and skillful approximation of tissues add greatly to the prospect of good repair and escape from infection.

DRESSING AND AFTER-CARE

Use a soft, firm non-constricting dressing of sterile gauze, as small as possible but adequate for any expected oozing; fix with narrow adhesive strips over the gauze or bandage. Avoid collodion dressings, especially on scalp wounds, as they seal exudate and form an ideal culture media for bacteria. Elevation, immobilization, rest and warmth aid nature in preventing hemorrhage and infection, also promote repair in the early stages of wound healing. Give a protective dose of tetanus antitoxin (1500 units) if there is any question of wound contamination with street dirt or soil, in a dirty puncture, or for severe head wounds. Initiate Pasteur treatment (e.g. the 14 dose Cumming's modification of antirabies inoculations) if there is any question of a rabic animal bite. Be sure your patient takes away medicine (as codeine or aspirin) to tide him over the first hours of discomfort. Before he leaves your office ascertain that he is prepared for comfortable transportation to his destination.

SUMMARY AND CONCLUSION

The following points are emphasized in their order of application for the treatment of fresh dirty wounds in the physician's office: Green soap and water, mechanical cleanse of the wound and its neighborhood, shave, local novocaine if indicated for a painful wound, thorough exploration and débridement, control of bleeding, antisepsis, repair, drainage, dressing and after-care. Scrupulous practice of these details is rewarded by healing *per primam* in a very large percentage of originally dirty and potentially infected wounds.

The writer in his association with Drs. C. R. G. Forrester, H. C. Lyman, and D. R. McLean is indebted to them for their example and aid in proving the efficacy of these rules of treatment.

SCALP BURNS IN WOMEN*

Robert T. Findlay, M.D.

NEW YORK

THIS article deals with a discussion of burns of the scalp, caused principally by permanent waving of the hair. Due to the present vogue of waved hair and the age-old attitude of women to be "in style", regardless of price or personal risk, the problem of injuries received during permanent waving has become of increasing surgical importance.

This series comprises the observation of

* Submitted for publication December 21, 1929.

19 cases of burns of the scalp seen during the past year and a half, 15 of which were treated by the writer; the observation of the remaining 4 cases was confined to an examination after the burned area had entirely healed.

The burns were all in women between the ages of nineteen and fifty years, with an average of about thirty-six years. Most of them were housewives but several were otherwise occupied, as stenographers, dressmakers, a nurse, etc. These women all received their injuries in hairdressing establishments or beauty parlors and the burn occurred in all but one case during the permanent waving of the hair. The remaining patient was burned by a hot iron while having a marcel wave. The cases came from 16 different establishments. Only two shops had more than one case, one having two, the other three.

According to the patients' statements the burns were thought to be due to excessive heat in 18 cases. In 16 cases the patients informed the operator of excessive heat and pain in the scalp. It is interesting to note that in only 4 of these were the complaints heeded, that is, the apparatus was turned off immediately and the area investigated; in 2 cases the complaints were partially heeded, i.e. the heat was turned off but the area was not investigated and the heat was resumed; and in 10 cases the complaints were entirely unheeded, the heat being allowed to remain on the required length of time. In one case the felt pad under the heating unit, which is supposed to protect the scalp, was actually charred. Two patients blamed their burns on inexperienced operators. In these cases the operators were students. The permanent waving during which these burns were received was done by regular operators or hairdressers in 14 cases, by the proprietor himself in one case, by students in 3 cases and undetermined in one case. In 5 cases the burns were acknowledged by the operator at the time. In 2 cases they were partially acknowledged, that is, some mention was made of a "red spot" on the scalp. In the remaining 11 cases, however, the burns were not acknowledged. This seems very negligent and very likely was in many cases but I believe that it is only fair to bear in mind that first and even some second degree burns are not all apparent immediately after the receipt of the burn; also that after the rather strenuous treatment which the scalp receives during any permanent wave that it would naturally be slightly hyperemic in appearance and probably more sensitive than it normally is.

In 10 cases the patients received no advice or treatment for their burns before leaving the hairdressing establishments. Eight cases were, at some time, advised or treated by the establishment, 2 of these being delayed several days, while one case was undetermined. The treatment consisted in the application of an ointment in 5 cases, oil in one, vaseline in one, collodion in one, a current of cold air in one, a shampoo in one, and advice against the use of a comb over the burned area in 3 cases. It is the opinion of the writer that there is no first-aid treatment that could be administered by the beauty parlor or by the patient which would do any good and practically all that has been done, as already described, is harmful. We will see under Treatment that any ointment or oily substance is harmful as it aids in defeating the entire principle of treatment. The opinion is, therefore, that the operators or proprietors of the hairdressing establishments should administer absolutely no treatment for the burns. It will give both the operator and the patient a false sense of security if any such treatment is carried out. Eleven of the patients did not treat themselves and 7 did, while one was undetermined. One of the 7 was treated by a nurse and the others applied ointments, vaseline and various concoctions.

Two of the cases were seen by the writer on the day the burns were received and a total of 9 were seen during the first week. The longest interval was ninety days with an average of thirteen days.

This delay, of course, made the proportion of infected cases much higher and was responsible in most cases for the resulting scar and hair loss. Eleven patients had not been under the treatment of any other physician before coming under the observation of the writer, 4 had had professional treatment before and 2 after. The number of treatments per patient by other physicians varied from 1 to 14 with an average of about 5 visits. The treatment by other physicians consisted partly in the following: The hair was clipped in only 2 cases, one at the request of the patient; in one case the doctor advised shaving over the burned area which the patient refused to have done; scabs were removed in one case; ointment prescribed in one, oil in another, boric acid in another; and in one case the patient was advised over the phone, the physician not having seen the burn. Adequate treatment of 16 of the cases was delayed; there was no delay in 2 and one was undetermined. Of the 15 cases treated by the writer, the treatment in only 2 cases was not delayed, that is, these 2 patients came for treatment on the day they received the burn. The remaining 13 were delayed. The number of days before putting themselves under the writer's care varied from none to ninety with an average of 11.6 days.

Symptoms. The patient's complaints were as follows:

1. Pain in all 19 cases.
2. Swelling in 10 cases (local).
3. Swelling of neck in 4 cases (regional adenitis was present in 4 cases, 2 anterior and 2 posterior).
4. Swelling of face in 1 case.
5. Earache in 1 case.
6. Fainting in 1 case.
7. Purulent discharge in 1 case.
8. Unsightly appearance in 1 case.

Diagnosis. We are dealing with burns of the scalp, the burning of the hair being a factor on only a few cases. The total number of burns in 18 cases was 47, one case being undetermined. The average was 2.6 burns per patient. In 10 cases the burns were single (55 per cent of the cases) and in eight (45 per cent) the burns were multiple. This emphasizes the importance of not overlooking any burned areas, as the patient may complain of one burn and have several others in other regions of the scalp which may not at the time cause any symptoms. The reason why these burns are liable to be multiple lies in the structure of the permanent wave machine. A short description of the machine will facilitate the understanding of the occurrence of these burns and why they are often multiple.

A permanent waving machine is made up of several dozen units attached to a central source of heat. Each unit is a cylinder with a rod running through it. The hair is wound tightly around this rod and the cylinder clamped around the rod. A felt pad is placed between the scalp and the unit to protect the scalp from the heat and the waving agent. The wound hair in the cylinder is moistened by a solution known as the waving agent and then steam is introduced into the cylinder. This procedure is repeated, using a small amount of hair to each unit until the entire scalp is covered. The waving agent in a majority of cases contains ammonia. The strength and quantity of the solution, as well as the amount and degree of heat, vary with the texture of the hair and the age of the individual. All of the solutions are alkaline. That is one reason why the use of tannic acid in the treatment of scalp burns caused during permanent waving is particularly indicated as it tends to counteract the effects of the alkali as well as to treat the thermic burns.

The parietal regions were most often affected, with 15 burns; occipital, 11; frontal, 10; temporal, 2; and one case undetermined as there were no scars at the time the case was examined. A more detailed delineation to show the distribution of these burns is as follows:

	Burns
1. Frontal (unspecified)	5
2. Right frontal	3
3. Left frontal	1
4. Left temporal	2
5. Parietal (unspecified)	6
6. Right parietal	2
7. Left parietal	3
8. Midparietal	4
9. Occipital (unspecified)	7
10. Left occipital	3
11. Mid occipital	1
12. Undetermined	1

Only one burn was first degree; 4 were first and second degree; 13 were second degree; one was second and third degree; none were third degree alone, and one was undetermined.

The size of the burns on first examination varied from 1/8 inch in diameter to 1¾ inches in diameter. The average diameter was .69 inches, or nearly ¾ inch. The total area of the 47 burns was 29.1 sq. in., the average area per case being 1.61 sq. in. and the average area per burn being .61 sq. in.

Treatment. Referring to the technic used in the cases which came under the writer's care (this will be described later in detail), 6 cases had the usual technic; tannic acid was used in 3; debridement under ethyl chloride local anesthesia was done in 3, and poulticing was used in 6. The total number of treatments by the writer in his 15 cases was 88, varying from 1 to 11, with an average of 5.86 treatments. The total number of treatments in 9 cases treated by other physicians both before or after the writer's treatment was 61, varying between 1 and 14 with an average of 6.77 treatments.

Morbidity. This refers to the number of days from the day of injury until the burned areas are entirely healed and require no further treatment. The morbidity varied from seven to one hundred twenty days with an average of 35.9 days. Considering only the writer's 15 cases the average was 37.6 days.

Ten of the cases were completed and followed to determine the presence or absence of permanent defect, 3 were partially followed; one was not followed; 3 were only examined after the burns had healed, and in one case a follow-up was unnecessary (clean case).

Some disability was suffered in all cases. Those that were employed lost time from work, either because of the pain or because of their appearance. This partial disability varied from one to thirty days with an average of about thirteen days.

Infection. Fourteen cases were infected, or 73.6 per cent, and 5, or 26.4 per cent, were not. Of the 15 cases treated by the writer 11 were infected before their first visit and 4 were not. None of these 4 became infected. These were cases that had not delayed treatment too long, 2 were seen on the day the burn occurred, one the following day and the other three days later. There were no permanent defects in these 4 cases. Thus the opportunity for the ideal treatment was offered in only 4 cases.

Results. Eleven of the patients or 58.8 per cent, had a permanent defect, 4 did not have a defect; 2 would probably not and 2 were undetermined.

There were resulting scars in 13 cases, 2 would probably not be permanent; 4 cases healed without any scar; 2 were undetermined, and one would probably not have a scar. There was an area of permanent hair loss in 10 cases; none in 6; 2 were undetermined, and one would probably not have hair loss. The size of the resultant scars varied from 1/8 × 1/16 in. to 7/8 × ¾ in. The largest measurement was 1¼ in. The average diameter was 5/8 in. The total area of scars in the 11 cases was 2 sq. in. The average area was 1/6 sq. in.

The scars were well distributed throughout the scalp, one in the frontal region, one temporal, 4 parietal and 5 occipital.

The detailed areas were:

	Cases
1. Left frontal	1
2. Left temporal	1
3. Right parietal	1
4. Left parietal	2
5. Mid-parietal	1
6. Occipital (unspecified)	1
7. Left occipital	3
8. Mid-occipital	1

Miscellaneous. It was interesting to note in 2 cases, both being eight weeks after the onset of the treatment (hair shaved over burn), that the hair had grown out from this area 2½ in. in one case and 1½ in. in the other. In one case, a young lady of twenty-four complained that since her burn her hair was becoming progressively gray (generalized, not in the area of the burn). This was a case that had had one burn, was treated immediately, remained clean and healed without scar or hair loss. The patient suffered no pain after the first day. It is the opinion of the writer that the burn did not cause the graying of the hair, which has not been observed in any of the other cases. In only one case was the burning of the hair an important factor. This was a case in which a small portion of hair was burned with only a first degree burn of the scalp.

TREATMENT

The treatment is very simple but like many apparently insignificant conditions the common fault is conservatism. The majority of physicians who had treated these cases, prior to their coming under the observation of the writer, made light of the burns, told the patients to apply a little oil or ointment to the scalp and evidently trusted to luck that the burns would not become infected and that they would clear up without any more radical procedure. We have seen, however, that the burns do not remain clean and that they do become infected. If we stop to consider a second degree burn of the scalp, for instance, we are dealing with a devitalized area, burned, both by heat and by the chemical solution in the waving agent (an alkali), with an area over which the superficial layer of scalp has been destroyed by blister formation, leaving an open wound, with an area covered with hair, which is anything but sterile. It is obvious then, that the susceptibility of this area to infection is extremely great. Add to this the common practice by the beauty parlors, the patients and even by physicians, of rubbing oil or an ointment into this open wound, matting the hair down onto the wound, forming a greasy crust, under which bacteria have an ideal medium in which to carry on their work of reproduction and the destruction of tissue. This often extends deep into the layers of the scalp causing sloughing of fascia, regional adenitis, etc., with resulting scar formation and hair loss.

It is logical then that the principle on which the successful treatment of these burns depends must be the prevention of a medium for the growth of bacteria. This is best done by removing hair, dead skin, grease, dirt, crusts, sloughs, etc., from the burned area and by keeping the wound protected from contamination by a dressing which at the same time allows the penetration of air. With this principle in mind, which after all is only common-sense surgical procedure, the following technic has been used in the treatment of the 15 cases:

1. Careful examination of the entire scalp, as with thick hair, and the usual presence of oil or ointment, a burn might be easily overlooked. The burns are often multiple and scattered over all of the areas of the scalp. This examination should include careful notations as to the number, size, shape, degree, locations, presence or absence of infection, presence or absence of regional adenitis or general manifestations. These cases are liable to have a medico-legal aspect and careful, accurate note taking will save the physician embarrassing situations. (See Fig. 1.)

2. Cut the hair in the region of the burn or burns, with scissors, then shave with a sharp razor over the burn and surrounding the burn for a sufficient area to apply a dressing. This is, of course, painful but is the most important part of the treatment and rarely has to be repeated over the same burn. If this procedure is too painful, especially over a swollen infected burn, it is advisable to do it under ethyl chloride local anesthesia.

3. All foreign material such as matted hair and ointments, burned loose skin, or in infected cases, crusts, sloughs, etc. are removed. Much of this is done with the razor during the shaving. Ethyl chloride is often employed in this procedure, where a crusted, infected area needs to be debrided.

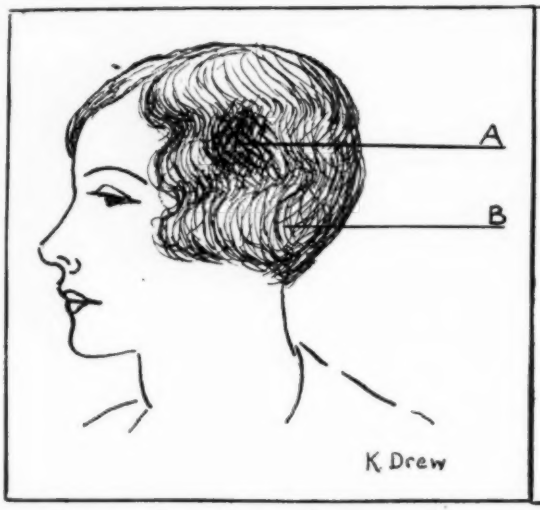

Fig. 1. A, Burned area with matted hair. B, Unburned area.

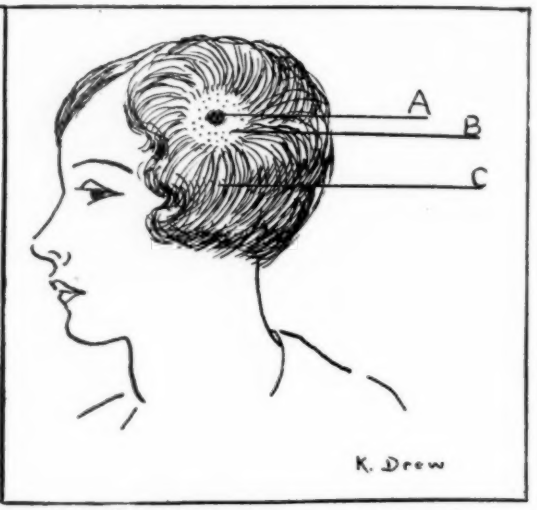

Fig. 2. A, Shaved burned area. B, Shaved area for dressing. C, Unburned area.

4. The open area is now cleansed with some antiseptic solution; benzine followed by ether or just carbon tetrachloride is very good. Carbon tetrachloride or ether are especially indicated as they not only are good antiseptics but also remove the oil from the scalp, leaving a clean dry area. (See Fig. 2.)

5. This step depends on the presence or absence of infection. In a clean burn of any degree, if not more than forty-eight hours old, freshly prepared 2 per cent tannic acid is used. The patient is instructed to drop a few drops of this solution, using a medicine dropper, through the dressing onto the burn every hour that she is awake for the first forty-eight hours and then every two hours until seventy-two hours have elapsed, after which the tannic acid is discontinued. The burned area should now be well tanned. It is thereafter dressed every few days with dry sterile dressings. Tannic acid is especially indicated, not only to treat the burn caused by heat but to neutralize the alkali which has also been a factor in causing the burn. The waving agent or solution used to moisten the hair before the heat is applied in giving a permanent wave is alkaline, usually containing ammonia.

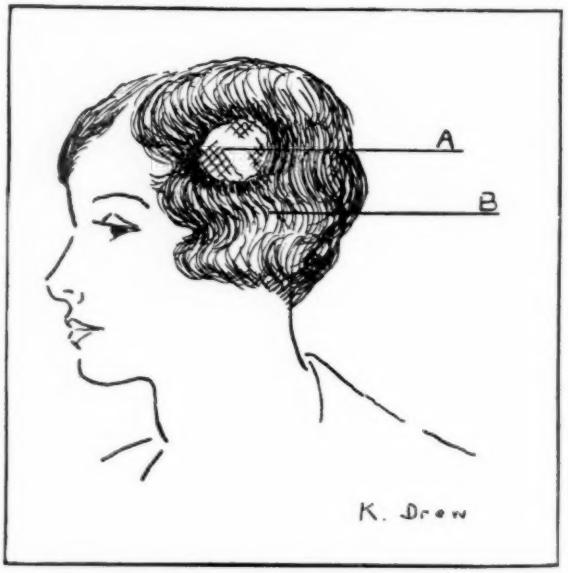

Fig. 3. A, Sterile gauze dressing over burn. B, Unburned area.

In an infected burn, ichthyol ointment may be used on the dressing followed by the application of flaxseed poultices or a hot-water bottle, to create a local hyperemia in order to localize the infection.

Tannic acid is, of course, not used on the infected burns.

6. A sterile gauze dressing is cut out to conform to the shape and size of the shaved area. The shaved area surrounding the burn is painted, by means of sterile cotton applicators, with a thin and narrow layer of liquid adhesive. A few layers of the gauze are now applied, then more liquid adhesive on the outer border of the dressing and then more gauze. This dressing is very satisfactory as it protects the burn from the hair and other contamination; it does not exclude air from the area; it allows any drainage to be absorbed by the gauze. It makes large cumbersome dressings unnecessary and the hair can be arranged to cover this dressing very readily, which, of course, is an important factor with the type of patient with which we are dealing, and lastly the liquid adhesive is better than collodion as it does not glue itself to the hair and scalp as tenaceously. (See Fig. 3.)

PREVENTION

Much could be said in regard to the prevention of these burns, such as proper instructions to hair dressers, prevention of the neglect in having the burns treated, etc., but that aspect is not in our province to discuss here.

CASE HISTORIES

It might be interesting to give the case histories of 2 rather typical cases:

Case I. Mrs. M. F., housewife, aged forty.

History. While being given a permanent wave at the establishment of Mr. X by Mr. X himself, ten days previously, the patient complained of excessive heat on the scalp. The patient stated that her complaints were unheeded and that the heat was not turned off until the regular period of time had elapsed. On leaving the beauty parlor she did not realize herself, nor was she informed, that she had been burned.

On arriving home that evening Mrs. F. noticed a blister on the left side of her head to which she applied an ointment. She telephoned her family physician the following day. He prescribed treatment by phone but did not see the patient. She continued to neglect the burn, but the pain and swelling became more severe and she noticed a lump under her jaw as well as swelling of the face and earache. She finally decided after ten days' neglect that she should put herself under medical care.

Examination showed an infected second degree burn of the left temporal region of the scalp ¾ in. in diameter, surrounded by a swollen, red and tender area. Edema of the left side of the face was present as well as enlargement of the left anterior cervical lymph glands. Temperature 100°F. by mouth.

Treatment. The usual shaving was done, also excision of scab and central infected area under ethyl chloride local anesthesia, followed by ichthyol ointment, dressing and advice to use continuous flaxseed poultices.

Progress. The burn was redressed the following day and poultices continued for forty-eight hours, after which the infection had nearly subsided. She was seen a total of 7 times, the last time being fourteen days after the first visit or twenty-four days after receiving the burn.

Result. On the last examination there was a bald spot with hair loss ⅛ in. in diameter which was practically negligible as it was not noticeable. This is rather remarkable considering the neglect and the severity of the infection.

Case II. Mrs. V. F., housewife, aged twenty-five.

History. While being given a permanent wave at the establishment of Mr. X by a student operator, a few hours previously, the patient complained of excessive heat on the top of the scalp after the heat had been applied for six minutes. The heat was removed and not reapplied. She did not realize at the time nor was she informed that the burn had occurred, but she was cautioned not to use a comb over the top of her head. This case was not neglected. Treatment was instituted on the same day that the burn was received.

Examination showed 3 first and second degree burns, each about ⅝ in. in diameter, distributed as follows: (1) midparietal; (2) right parietal; (3) right frontal regions. There was also slight redness and evidence of irritation on the other regions of the scalp.

Treatment. The usual shaving was done, removal of blebs, application of dressings and tannic acid routine instituted.

Progress. The patient suffered pain only on the first day. The burned areas remained clean. The patient was seen only 4 times and on the last visit, which was exactly one week after receiving the burn, the areas were healed and clean.

Result. The patient was discharged on the seventh day with no scar or permanent hair loss. This is, of course, an ideal case.

CONCLUSION

Burns of the scalp in women should be considered as an important surgical lesion. The results of nelgect, delay in treatment and inadequate (conservative) treatment are many, such as infection, resultant scars and hair loss, discomfort and disability. In contrast, dealing with cases that are not neglected, and in which the treatment is not delayed, and in which the treatment consisted of the technic already described, the results were excellent, with no infection, no scars or hair loss, and very little discomfort and disability.

MANAGEMENT OF CONJUNCTIVITIS*

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FULLY 25 per cent of the patients that come to an ophthalmologist in a city present some form or other of conjunctivitis and as a result, much of an ophthalmologist's time is spent with this condition. In the majority of cases, a simple inspection of the everted conjunctivae will serve to permit of a clinical diagnosis upon which treatment can be based. In a few cases, microscopic examination of the conjunctival secretion or epithelial scrapings from the conjunctival surface is required for thorough understanding of the case; but for routine office practice, such examinations are required only in the exceptional case. The majority of cases observed fall into one of the following groups:

1. Catarrhal conjunctivitis.
2. Acute or chronic follicular conjunctivitis.
3. Acute or chronic purulent conjunctivitis.
4. Subacute or chronic blepharo-conjunctivitis.
5. Secondary conjunctivitis (due to tear-sac disease, sinus infection, eserine or atropine irritation, etc.).
6. Conjunctivitis of special types as vernal, trachoma, plasmacellularis, etc.

1. *Catarrhal Conjunctivitis.* This is the most common form of conjunctivitis and manifests itself as a simple hyperemia of the tarsal conjunctiva and causes a burning or itching sensation. It is never accompanied by any purulent secretion, but there may be present a soapy foam-like-secretion which is due to the saponification of the excess secretion of the Meibomian glands. This form of inflammation may be bacterial in origin, but is more than apt to be due to some mechanical or extraneous irritation. Good results usually follow the use for several weeks of eye drops two or three times a day, composed of 2 per cent resorcin or 0.5 per cent zinc sulphate or 0.1 per cent zinc chloride in 3 per cent boric acid solution. For the past year, a 50 per cent solution of hexyl-resorcinol has been used with some satisfaction. In this type of case, which may be rather persistent, the armamentarium of the ophthalmologist must be great, for not infrequently is it necessary to vary the character of the astringent used. Among other solutoins that may be given the

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patients for home use, must be mentioned 3 per cent quinine sulphate, 1 per cent tannic acid, 0.1 per cent dilute acetic acid, and 4 per cent camphor water as an eyewash. A very satisfactory mechanical flushing solution can be prepared by the patients at home by putting into 1 quart of water, 1 teaspoonful each of ordinary table salt, baking soda, and boric acid, and adding, after solution, 1 tablespoonful of glycerine.

2. *Follicular Conjunctivitis.* By acute follicular conjunctivitis is meant that type with massive follicles that can easily be mistaken for trachoma. In this type, expression must be performed and this is best done in the hospital under general anesthesia. Subsequent to the expression, massage forms the mainstay of the treatment. For this, the conjunctivae must be anesthetized and it is preferable to use an anesthetic that does not dilate the pupil, such as 2 per cent butyn or 1 per cent holocaine or 1 per cent tutocaine. The lids are then everted and the conjunctival surfaces rubbed thoroughly with a cotton-wound applicator dipped into mineral oil. The massage is continued for several minutes until the conjunctivae are rather hyperemic. The excess of oil is then flushed off with any neutral solution. For home use, this form of conjunctivitis yields most rapidly to the use of a 1:5000 aqueous solution of oxycyanide of mercury, used in an eye-cup as an eyewash.

As a rule, the chronic follicular conjunctivitis does not need an expression; but it usually is very slow in responding to treatment. The massage with mineral oil as used in the acute form is not sufficiently stimulating and the massaging applicator should be dipped into powdered boric acid or powdered sodium salicylate. This is apt to produce a very mild bleeding from the surface of the conjunctiva, a result that is to be desired. Such treatment should not be carried out oftener than once or at the most twice a week. The same oxycyanide solution should be used at home three or four times daily.

3. *Purulent Conjunctivitis.* The common type of acute purulent conjunctivitis is usually due to a mixed infection by some forms of staphylococci, streptococci, and pneumococci. If the latter organisms predominate, the usual clinical picture presents an additional feature; namely, minute hemorrhages in the conjunctiva, involving the bulbar more than the tarsal conjunctiva. Cleanliness is necessary for rapid recovery in these cases, as well as the frequent use of a bactericidal agent. Seemingly, the most effective of the latter for home use is 1 per cent mercurochrome, used as eyedrops from two to five times a day. If the patient is careless and allows the fluid to overflow the lids, an unpleasant staining of the cheek is produced. This can be avoided by anointing the skin of the lower lid with cold cream before using the solution, removing the cream after all danger of an overflow has passed. Among other solutions that have proved effective in this condition are 4 per cent targesin, 2 per cent sophol, 10 per cent neo-silvol, and 0.5 per cent freshly prepared protargol. If there be clinical or bacteriological reason to suspect a predominance of pneumococci among the infecting organism, 1 per cent ethyl-hydro-cuprein (optochin) should be used as an adjunct. But this alone seldom eliminates the remainder of the infection. For cleansing purposes, any non-irritating solution suffices, for it is only the mechanical flushing of the conjunctival surface that is desired. Boric acid and salt solution (normal) seem to be the favorites.

In chronic purulent conjunctivitis, the treatment is much the same as in the acute forms, but is rendered less frequently. But in addition, it is usually necessary to stimulate to conjunctiva to further bacteriotropic action and for this purpose, fresh 1 per cent silver nitrate is most efficacious. The best results follow instillation without further neutralization with salt solution. It is the practice of some to paint the everted conjunctivae with silver nitrate solution and wash off

the excess of silver with normal salt solution; but this method does not allow the silver to penetrate the recesses of the transitional folds. The instillation of a drop of silver nitrate into the conjunctival sac is followed by a convulsive closure of the eyelids, which tends to spread the solution uniformly over the entire surface of the conjunctiva, including the transitional folds. Neutralization with salt solution is not necessary as the tears perform that function.

4. *Blepharo-conjunctivitis.* Subacute blepharo-conjunctivitis is seldom accompanied by ulceration of the margins of the lids, although there is a crust formation at the roots of the lashes. The conjunctivitis phase has usually preceded the blepharitis phase by a considerable period of time and as a result, there are apt to be many dead lashes visible. These may occur as:

(1) Normally situated lashes with a black root clearly visible through the surrounding tissue and with a shaft slightly darker than the normal lash shaft. When removed, the root is found to be slightly more bulbous than the normal, completely black, and much more flexible than the normal.

(2) Abnormally located new-formed lashes, much more delicate in texture than the normal. These evidently arise from a normal follicle, but emerge through a new formed channel that may lie a full millimeter nearer the conjunctival surface than the normal lash line. The roots of these lashes are also black and flexible, but are not apt to be very bulbous.

(3) Two lashes arising from one normally situated follicle. They are always of unequal size, the larger being the normal lash of that follicle and the smaller, the new-formed pathological lash with a black root. The only abnormality about the larger lash is that it is apt to be somewhat thicker and stronger than its normal fellows.

These abnormal lashes are the result of the peculiar irritation of this form of blepharo-conjunctivitis and their presence establishes a vicious cycle. The irritation starts the abnormal lashes and the abnormal lashes, by their mere presence, continue the irritation. Consequently, they should all be removed mechanically. Electric epilation is not necessary. In addition to the epilation, the conjunctival irritation must be cared for. Violent treatment is not necessary and these respond well to the local use of 1:5000 oxycyanide of mercury two or three times daily. In addition, the edges of the lids should be well anointed each evening the last thing before retiring. For that purpose, a 1 per cent noviform ointment has given more satisfactory results than the time-honored yellow oxide of mercury ointment. The so-called Betti salve is preferred by some. The condition is not very difficult to control, but is very apt to recur unless treatment is continued for a considerable period of time after all visible manifestations of inflammation have disappeared. Continued recurrences can easily lead to the condition of chronic blepharo-conjunctivitis ulcerosa.

In chronic blepharo-conjunctivitis ulcerosa, small superficial ulcers appear at the roots of the lashes. The size and depth of the ulcers depend upon the length of time that they have existed. Accompanying them is a chronic hyperemia and thickening of the margins of the lids together with a partial or complete loss of the sharp approximating edge of the lids where the transition from the conjunctival to the skin epithelium takes place. The conjunctiva proper shows a condition of hypertrophic inflammation. Meticulous cleanliness of the lid margins is one of the essentials for recovery. The closely adherent crusts must be soaked and then wiped loose from the base of the lashes, not once but several times a day. The ulcers are thus exposed and they should be touched carefully with silver nitrate from 1 to 20 per cent strength. Care must be taken that none of the stronger silver solutions come into contact with the conjunctiva and conse-

quently the excess of silver nitrate must be neutralized completely with salt solution. This treatment should be carried out daily until the ulcerative areas have become epithelialized. For home use instillations of a bland colloidal silver solution have proved efficacious. In addition, it is well to rub into the base of the lashes an ointment containing 2 per cent resorcin and 2 per cent precipitated sulphur in a base of equal parts of lanolin and vaseline. But care must be exercised that none of this is smeared on the conjunctiva for a rather unpleasant irritation is apt to result. After the acute ulcerative condition has been relieved, it pays to modify the therapeutic measures. From here on, the use of fluorescin zinc has justified itself. This is a reddish powder formed by the combination of potassium fluorate and zinc sulphate and is soluble one part to a thousand of water. Upon solution, it reverts to its original constituents. In practical use, a small amount of the powder is rubbed gently on to the anesthetized conjunctiva where it is dissolved slowly by the tears. Thus the conjunctiva is kept bathed for several hours in a weak solution of zinc sulphate and potassium fluorate, which latter is absolutely inert. It has been found practical to instruct patient in the use of the powder and have it applied daily at home for longer periods of time.

5. *Secondary Conjunctivitis.* But little need be said about secondary conjunctivitis beyond the fact that the diagnosis is the essential feature. There are certain peculiar stigmata to this condition that reveal it plainly to the eye of the practiced ophthalmologist. When once diagnosed, the conjunctiva clears readily following removal of the source of irritation.

6. *Special Types.* It does not lie within the scope of this general paper to discuss the treatment of the special forms of conjunctivitis gathered under this general heading. Each form in itself requires study and therapeutic artistry. Some respond to varied local treatment, others require systemic management, and many will yield only to a combination of both. The therapy of trachoma alone requires many many pages to merely scratch the surface, let alone discuss the non-surgical management of the complications. Consequently, it would seem preferable to postpone discussion of the treatment of the specialized forms of conjunctivitis for some future article.

STENOSIS OF THE CERVIX*

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THE intelligent treatment of any disease-process must be founded upon an understanding of the causative pathologic conditions: this is especially true in regard to those conditions (for example, stenosis of the cervix) which may be either primary, or merely secondary to some causative condition which is the essential feature of the situation. In the management of cases of stenosis of the cervix the following classification of the underlying pathologic processes has been found to be a reasonably satisfactory foundation upon which to build up the plan of treatment in the given case:

I. Developmental stenosis:
   1. Simple
   2. Associated with:
      a. Hypoplasia
      b. Uterine flexion
      c. Fusion defects

II. Atrophic stenosis:

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1. Senile
2. After castration

III. Traumatic stenosis:
1. Postpartum:
   a. Occlusive agglutination and healing together of denuded surfaces
   b. Cicatricial contraction
2. Postoperative:
   a. Occlusive agglutination and healing-together of denuded surfaces or edges of flaps
   b. Cicatricial contraction
3. Post-radiation: cicatricial contraction and atrophy

IV. Inflammatory stenosis (specific and non-specific infections):
1. Endocervicitis, acute and chronic: thickening of the mucosa of the canal
2. Occlusive agglutination and healing
3. Cervicitis, acute and chronic:
   a. Edema and hyperplasia of the stroma of the cervix
   b. Contraction of inflammatory fibrous tissue
   c. Cystic cervicitis

V. Neoplastic stenosis:
1. Benign:
   a. Mucosal (fibroadenoma)
   b. Stromal (fibromyoma, etc.)
2. Malignant:
   a. Cancer
   b. Sarcoma (?)

The neoplastic group (with the exception of fibroadenoma, which rarely gives rise to obstruction of the cervical canal) are not to be considered as suitable cases for ordinary office treatment. In those cases where the stenosis is merely incidental to active or passively active inflammation (endocervicitis, edema, hyperplastic cervicitis, and cystic cervicitis) the stenosis should not be treated until after the causative condition has been relieved by appropriate treatment, because dilatation in these cases does no good and may do harm, and because the stenosis usually disappears as a symptom-producing entity upon the relief of the causative inflammatory process. The treatment of these inflammatory conditions is becoming more and more an office procedure as the proper use and the effectiveness of the small electric cautery is better understood and more and more widely employed. In the presence of acute infection, dilatation is of course contraindicated.

In the developmental group (especially when associated with hypoplasia, flexion or fusion defects), in the cases of post-inflammatory and in some cases of post-operative cicatricial contraction, office treatment will frequently be found to be unsatisfactory on account of the facts that the whole length of the cervix is involved, that the tissues are very resistant to dilatation, and that dilatation of the internal os (which is absolutely essential in cases of developmental stenosis) is difficult and painful. In all of these conditions the cervix must be over-dilated to a considerable degree (40 F.) and the dilatation maintained for a time by a cervical pack (seventy-two hours) or an indwelling tube (three to six weeks, in virginal cases only) if the results of treatment are to be of any lasting duration. Only too often it will be found that a prolonged and uncomfortable series of gradual dilatations is followed by a period of relief which is much shorter than that secured by the single thorough dilatation under anesthesia. On the other hand, it is often possible to afford much relief, where symptoms begin to recur after any form of dilatation, by a single office treatment in the week preceding menstruation (or at varying intervals in menopausal cases). If the treatment room is maintained as a minor operating room, affording adequate assurance of asepsis, practically all of the cases in this group can be treated properly under local block infiltration. By using an extension sleeve (of the type employed in tonsillectomy) the needle can be inserted into the tissues about the cervix without interference with vision. About 20 c.c. of 0.5 per cent novocaine is injected in a collar completely surrounding the cervix,

the points of injection being close against the cervix and the point of the needle just beyond the vaginal wall. If the internal os is to be dilated, the needle is inserted in front of the cervix (at the positions of 10 and 2 o'clock on the clock-face), and passed up to a point just above the internal os, outside the substance of the cervix. At each of these points 10 c.c. of the anesthetic solution is injected after having made sure that the point of the needle does not lie in a blood vessel or in the peritoneal cavity. The solution diffuses pretty thoroughly into the loose parametrial tissues and into the bases of the broad ligaments, affording, usually, a very satisfactory anesthesia for any procedure which does not require much dragging-down of the uterus.

The trophic stenoses (except in hypoplasia), the cases of traumatic and inflammatory occlusion through healing-together of denuded surfaces, and some cases of minor or localized cicatricial contraction (especially post-radiation contraction) form the group in which single or repeated dilatation without anesthesia is especially successful. In using dilators of the expanding type, the screw should never be used to force the blades apart, on account of the danger of exerting a pressure which may lacerate the cervix; the screw is, however, useful in relieving the muscles of the operator by maintaining the degree of separation of the blades secured through manual pressure. If graduated serial dilators are employed, they should be hollow, in order to avoid the piston action of the solid dilator, which may force infected material or bits of living endometrium into the tubes or into the peritoneal cavity. That this is a real danger may be shown by placing a small amount of bismuth paste in the uterine cavity prior to such dilatation and inspecting the fimbriated extremities of the tubes when the abdomen is opened. The writer has not yet reached any definite conclusion as to the effectiveness of electricity in connection with the treatment of cervical stenosis.

It is impossible to set forth any dogmatic rule in regard to the degree of dilatation and the number of treatments required, as these points must be determined through careful study of the individual case, especially in regard to the sensitiveness of the patient, the mechanical difficulties, and the degree and duration of the relief afforded.

TONSILLECTOMY IN THE OFFICE*

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DES MOINES, IOWA

WHETHER tonsillectomy should be performed in the hospital or in the office depends largely upon the office. In a one-man office, with but a single attendant, it is inadvisable. But in an office with a chief, assistants or associates who are thoroughly competent, and nurses who are properly trained for this work, it would seem that this operation can be performed as safely as it can be done in a hospital. We assume that there is, in connection with such an office, an operating room with an equipment equal to that of any hospital operating room.

Before performing a tonsillectomy it is well to have a report from the patient's physician. Not only must one decide that there is a clear indication for the operation, but one must also be sure that the patient's physical condition warrants it. Before operation a test of the coagulability of the blood is made.

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There is no reason why the procedure of operation in hospital and office should differ. In the case of adults, my experience justifies a local anesthetic. About half an hour before the time of operation a hypodermic of morphia is injected. There are substitutes for this but morphia acts well in the majority of cases. Everything being in readiness the nurse usually employs cocaine as local anesthetic. This is applied, on a cotton swab, about the fauces and tonsils. A clever nurse may accomplish much in the preparation of the patient, not only by allaying any disposition to nervousness, but also by training in the manner of opening the mouth, in the control of the tongue, and in proper breathing. Next the operator injects the novocaine about both tonsils. A few minutes is required for this to have the desired effect. In the case of the average patient, conversing in an ordinary manner diverts his attention and lessens his anxiety. At this stage equally skillful operators differ greatly in their ability to handle the patient. Confidence, as evidenced by experience and skill, goes far towards making the patient's position less trying. This "vocal anesthesia" is a great help.

When the first tonsil has been removed the wound should be carefully inspected and found to be in good condition before removing the second tonsil. It is well to make an application of iron or an astringent in the tonsil beds. If there is a persistent hemorrhage firm pressure is made, for a time, by means of a good sized gauze pad in a sponge holder.

As to whether the operation has been performed with the patient seated in a chair or reclining upon the operating table is a matter of choice in cases where the patient is under a local anesthetic. The operation being completed, the patient is permitted to occupy a comfortable chair or to recline on a bed. If he is on the bed it is better that he lie on his side as, in this position, the blood and saliva run easily from the mouth and clearing the throat is avoided. The longer this position is maintained the less likelihood there is of a clot becoming dislodged and of hemorrhage resulting.

In the case of children and unusually nervous individuals a general anesthetic is used. The patient is in a reclining position on the operating table. The table should be inclined so that the head is lowered.

Too deep anesthesia is to be avoided. Aspiration should be employed. In an experience covering more than thirty years I have seen only 2 cases of lung complications and both of these were early in my practice.

Following operation, under general anesthesia, application other than pressure at the bed of the tonsils, to control hemorrhage, is not employed.

At this point we have arrived at the debatable ground as to the respective merits of hospital or office operation. All things being equal I prefer the office operation. The average case, after office operation, rests in the office for two or three hours. At the end of this time the patient returns to his home, to the hotel if acccompanied by relative or friend, or to the hospital if there is any reason for so doing, such as a tendency to bleed, excessive nervousness, being alone in the city, etc. In any event he is supplied with telephone numbers of the force so that, in case anything untoward develops, he may call for and receive assistance within a very short time.

In my experience it has been found necessary to use a ligature only a very few times. No patient of mine has been lost from hemorrhage following tonsillectomy.

The patient, being in an operating room, at the office, next door to several surgeons, is assured of better care and more prompt attention than would be the case were he in a hospital in charge of interns with less experience. Should the necessity arise, any one of the doctors in the office could step in and care for him much more quickly and conveniently than could be done were he in a hospital.

There can be no hard and fast rule as

to whether tonsillectomy should be performed at the hospital or at the office. This operation should not be undertaken lightly. There should be well-defined indications for it. The result of the examination by an internist should be had, especially in questionable cases. Even when the surgeon prefers the office operation he must be guided by the condition and wishes of each individual patient. A careful study of the patient, a thorough knowledge of the location under consideration as to anomalies, an accurate operation, the comfort and safety of the patient; all these should be the controlling factors in deciding which is the more suitable place for performing tonsillectomy, the hospital or the office.

URETHRAL CARUNCLE*

Paul A. Ferrier, M.D.

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URETHRAL caruncle is a distressing neoplasm common in women. While patients may have suffered for years, they are often unable or unwilling to have hospital treatment. An effective office treatment is very desirable.

The cause of caruncle is not known. It occurs at any age, but is most common in mid-life. It may be of any size, from that of a pinhead to that of a raspberry. It may be sessile or pedunculated, but it is practically always located on the posterior rim of the female urethral meatus. At times it is excruciatingly painful. Skene said; "In these extremely painful neoplasms some patients give evidence of constant pain, distress and anxiety; they are pale, emaciated, low-spirited, and wish for death." Some caruncles are not sensitive.

PATHOLOGY

Virchow describes the growth as a vascular polyp. Histologically it is composed of tufts of capillaries in a fibrous and muscular stroma, more or less infiltrated with round cells, according to its degree of inflammation. No nerve endings are found except in the covering epithelium. Cancer has been frequently known to arise on a caruncle.

DIAGNOSIS

It must be differentiated from:

1. Prolapsed urethral mucosa. This, however, will be seen to pout completely around the meatus.
2. Varicosities. These subside when the patient is in the Trendelenburg position.
3. Condylomata. They are generally associated with similar growths on other parts of the vulva.
4. Cysts of Skene's gland.
5. Solid tumors of the urethra. They are rare, and are seldom limited to the area of the posterior rim and are more solid.

TREATMENT

The conditions to be met are:

1. Complete eradication.
2. Restoration to normal of the urethra, particularly avoiding stricture or tractions on the bladder neck.
3. Obtaining a specimen for histological study to rule out malignancy.
4. Minimizing the inconvenience to the patient.

Many methods have been used, but the essential of all is the complete removal of that part of the basement membrane bearing the tumor. Anything less than complete removal is sure to be followed by recurrence. Lawson Tait mentioned a case in which a tumor had been removed every five years for forty years. In some such cases the scarring is more damaging than the original caruncle. Stricture is

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frequently caused by fulguration or deep cautery.

When a growth is sessile, resection as practiced by Kelly is necessary, but this is a hospital procedure.

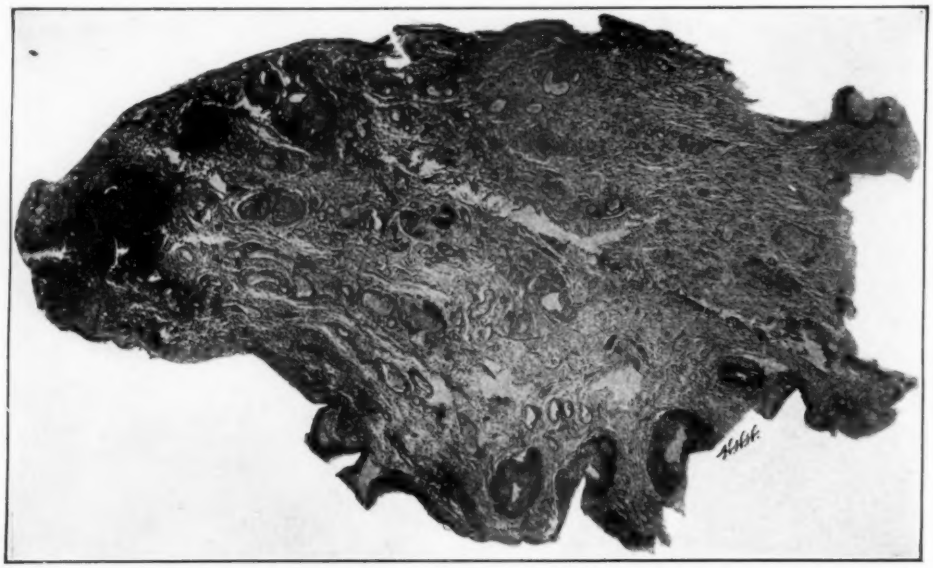

Fig. 1. Urethral caruncle. Centrally, many of the vessels are in loose fibrous stroma; surface is covered by layer of partly squamous and partly transitional epithelium at margin. (From Kelly and Burnam's Diseases of the Kidneys, Ureters and Bladder, D. Appleton & Co.)

Fulguration is widely used, but it almost always burns too deeply, leaving a heavy scar. The convalescence is unnecessarily long and painful, and stricture often follows. Hot iron and chemical cautery are even more objectionable.

The following method is very satisfactory for all but the broadly sessile type. It is an office procedure, and is a modification of a method suggested by Crenshaw.

OFFICE TREATMENT OF CARUNCLE

The patient is placed in the lithotomy position, and given a thorough soap and and water cleansing. Local anesthesia is obtained by a tablet of 2¼ grains of cocaine in just sufficient water and lubricating jelly to saturate a cotton applicator, which is inserted into the external urinary meatus. In about five minutes an assistant separates the labia. The urethra is dilated and the margins of the growth defined. The caruncle is then drawn up with a fine Allis forceps and clamped beyond its base as recommended by Crenshaw with a slightly curved hemostat, which has been ground flat resembling a miniature hemorrhoid clamp. The protruding caruncle is cut off and preserved for section, while the cut edge is carefully cauterized with a very fine electric cautery, such as is used in the nose.

If the procedure is properly carried out only one fine line of cautery is present, which heals rapidly without pain. No postoperative treatment is necessary. After healing is complete one urethral dilation should be done. If the caruncle is so broad that it cannot be included in such a clamp the method is not applicable. In my experience it has been useful for half the cases.

The advantages of this method are:

1. It is an office procedure.
2. It is painless with local anesthesia.
3. There is no bleeding.
4. Immediate relief is obtained.
5. A specimen is available for microscopic diagnosis.
6. On account of the narrow linear scar a minimum of epithelization is necessary, and stricture does not follow.
7. Recurrences are few.

DEPARTMENT OF RADIOLOGY

JAMES T. CASE, M.D., F.A.C.S., EDITOR

INTRAVENOUS UROGRAPHY BY MEANS OF UROSELECTAN*

M. SWICK, M.D.

NEW YORK

THIS work was begun with Selectan Neutral,[1] synthetized by Professor Binz and Doctor Räth and utilized against coccus infections on the Medical Service of Professor Lichtwitz at the Städtisches Krankenhaus, Hamburg-Altona.[2] The study of its excretion[3] and its iodine content (54 per cent) led to the thought that it might be applicable for roentgenologic purposes. Experiments on rabbits demonstrated the fact that the kidney parenchyma and urinary bladder could be visualized after the intravenous administration of the drug; the pelvis and ureter, on the other hand, were poorly seen. Ligation of the latter did, however, bring the upper tract well into view. Simultaneous studies of its excretion, limited to quantitative determinations of the iodine component, revealed 75 to 80 per cent of the injected iodine in the urine. Save for traces of the latter element in the bile, its presence in the tissues and feces could never be detected.

Concerning toxicity and tolerance, it was found that 0.2 grams per kilogram of weight could be intravenously administered to the rabbit without any demonstrable ill effects; 0.33 grams per kilogram, however, produced transient generalized disturbances. On the basis of these calculations, one could theoretically give to a sixty kilogram individual eighteen grams of the substance as a maximal dose. Because of marked individual differences in man, the quantity administered was far below the above calculated one. Headache, nausea, vomiting and, in two cases, transient diplopia were disturbing factors. However, there never occurred a reaction severe enough to distract one from pursuing the studies. The oral and rectal administration of Selectan Neutral yielded similar roentgenologic results and toxic manifestations. In all cases the urinary bladder was seen. The kidney parenchyma appeared to stand out more in relief; in two cases of contracted kidneys the reduction in size could be noted. Only on producing a temporary artificial obstruction in the ureter by means of a bougie at the time of maximum excretion was the upper genito-urinary tract outlined, though not very prominently. In other words, the attained results, though not sufficiently good for practical purposes, pointed to the possibilities of further development. The problem then resolved itself into a modification of the substance so as to accomplish the following:

[1] In 1923 Osborne, Sutherland, Scholl and Rowntree were the first to attempt the visualization of the urinary tract by means of intravenous injection of a 10% solution of sodium iodide. In 1924 Rosenstein and von Lichtenberg repeated the work with iodide in conjunction with the perirenal pneumo-radiographic method of Rosenstein. Volkmann, in 1924, Lenardouzzi and Pecco in 1927, have also given an account of their findings. Hryntschak, at a congress in 1928 and in the *Zeitschrift für Urologie*, 1929, reported his work. Finally, Reseno by means of the intravenous use of a substance containing sodium iodide bound to urea was the first to achieve practical results but apparently associated with some reactions.

[2] Swick, M. *Klinische Wochenschrift* 1929, 8, 2087. von Lichtenberg and Swick, M. *Klinische Wochenschrift*, 1929, 8, 2089.

[3] Some studies of the excretion into the bile or urine had been done, though not reported, by Erbach in Prof. Lichtwitz's Clinic.

* Presented by invitation before the Section of Genito-Urinary Surgery, N. Y. Academy of Medicine, Jan. 15, 1930.
Work done under a grant from The Emanuel Libman Fellowship Fund.

(1) To diminish the toxicity through the substitution of the methyl group in order to permit the administration of a larger dose and thus attain a higher concentration of the excreted iodine component, a determining factor for roentgenologic success. (The observation in two cases of double vision led to the suspicion, at least empirically, that the methyl radical of the Selectan Neutral might be responsible for the toxic manifestations.)

Fig. 1. Female, 37 years old. Left renal and right ureteral calculi. Both kidneys, pelves, ureters and bladder visualized, Dilatation of left pelvis and ureter. *X*-ray taken 15 minutes after injection.

(2) To increase its solubility.

(3) To increase the iodine content of the molecule.

(4) To possibly increase the affinity for the kidney.

Thereafter the work was continued on the urological service of Professor von Lichtenberg at the St. Hedwig Krankenhaus in Berlin. To eight cases 7.5 grams of the original substance, Selectan Neutral, were administered by mouth with the already described toxic reactions. The bladder was seen in all cases. Only in one case, that of a stone obstruction of the ureter, about one inch below the uretero-pelvic junction, was a useful *x*-ray film obtained. The further studies, as already pointed out, occupied themselves with the seeking and application of other substances of similar nature with, however, the substitution of the methyl radical.

With the above prerequisites in view; Professor Binz and Doctor Räth of the Landwirtschaftliche Hochschule in Berlin (Chemical Institute) prepared modifications of the original substance. The first because of their higher iodine content, were very poorly soluble in water and unsuitable for intravenous application. Oral administration was likewise inadequate because of their poor absorption by the gastro-intestinal tract. With the reduction of the iodine content and the substitution of the methyl radical, the clinically applicable and successful substance, Uroselectan, was finally obtained.

Uroselectan is non-toxic, very soluble in water, neutral in its reaction, and under normal conditions excreted as such through the genito-urinary tract within eight hours practically to the extent of 90 to 100 per cent, suggesting the likelihood that no chemical reaction takes place in the body. Examination of the blood for the presence of the iodine component fails to reveal it at different intervals five minutes to three hours after the injection. Studies upon the tissues for the distribution of Uroselectan are still in progress. The iodine in the molecule exists in a very stable organically bound state. Neither in solution nor in its excreted form is the iodine present in an inorganic, ionized state. This fact together with the relatively large quantity of the calculated iodine element of Uroselectan that can with impunity be administered would lead one to reason, at least empirically,

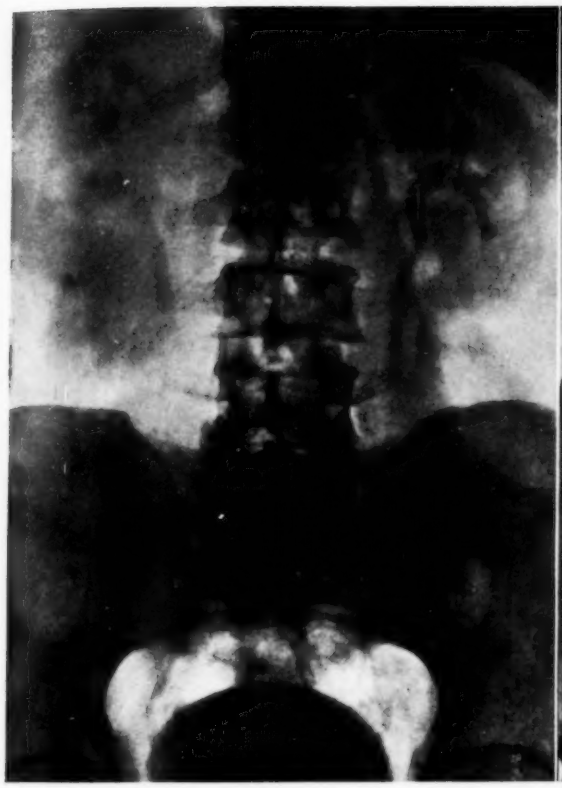

FIG. 2.

FIG. 3.

FIGS. 2 and 3. Male, 54 years old. Left renal calculi in pelvis and lower calyx. Right urinary tract normal Fig. 4 shows almost complete emptying on the right side and points of constriction at the calyceal necks as well as stones in pelvis and calyx.

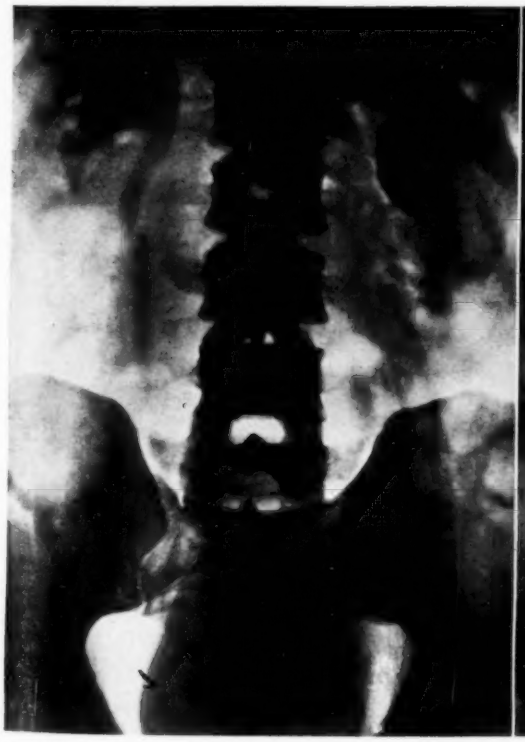

FIG. 4. Male, 37 years old. Left ureteral calculus. Dilatation of left ureter and pelvis. Right kidney and pelvis appear to be rotated on themselves. *X*-ray taken 30 minutes after injection.

FIG. 5. Female, 40 years old. Left solitary kidney. Entire urinary system visualized.

why iodism has never been observed. Apparently one can speak of the toxic and therapeutic effects of an iodide when the iodine exists in an inorganic ionized form.

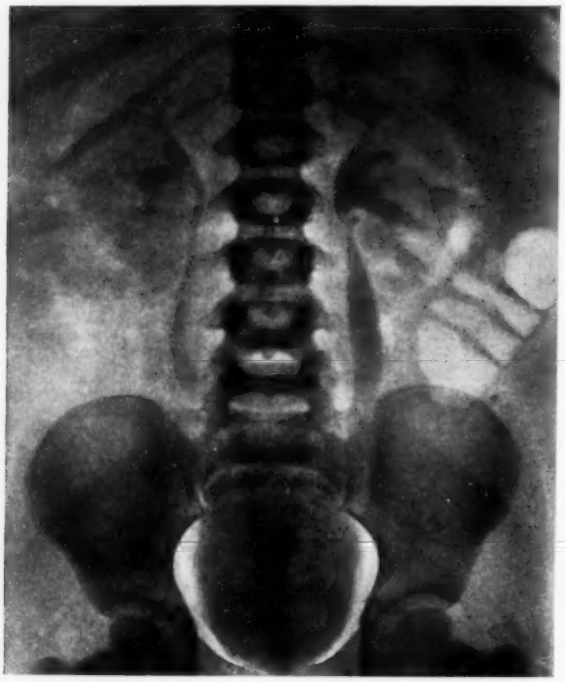

Fig. 6. Female,—5½ years old "Pyelitis." Dilatation of right ureter and pelvis. Twist of right ureter just below uretero-pelvic junction. *X*-ray taken 45 minutes after injection.

Its tolerance is exceedingly great. To a mouse, seven grams per kilogram of body weight can be intravenously administered without ill effects. As a test dose the same rabbit repeatedly received intravenously three grams per kilogram of body weight. Utilizing the latter dose as a basis for calculation, it follows that 180 grams of the substance, in terms of iodine, 75.6 grams, can be theoretically administered to a sixty kilogram individual.

Quantitative determinations of the excreted substance can form the basis for a functional test. Studies in this direction are still being continued. From the results already obtained, it appears that a normally functioning kidney possesses the ability to excrete this substance with a thrust, that is, a relatively large quantity within a given short period. This can be characterized as the normal "thrust-excretion," present during the first two hours. To illustrate, about three-fifths of the substance is excreted during the first two hours, about one-quarter during the next, and the remainder during the subsequent four hours. Aside from the dose administered and the extrarenal factors influencing renal secretion, the "thrust-excretion" ability of the normally functioning kidney plays a vital role in determining good roentgenologic visualization. In spite of the fact that substance is excreted during the subsequent periods, poor or no visualization is obtained. Good visualization is dependent upon a definite concentration of the shadow-giving element, determined by the factors enumerated. When the additional pathological

Fig. 7. Female, 2 years old. Tumor occupying right half of abdomen. Normal left urinary tract and bladder visualized. Questionable shadow running transversely on right side from crest of ilium to sacro-iliac synchondrosis—renal pelvis. *X*-ray taken 50 minutes after injection.

factor of obstruction is present, the otherwise normal height of excretion, provided that excretion takes place, is not so essential. Accordingly, visualization or poor visualization or non-visualization of the genito-urinary tract is dependent upon the functional activity. In other words, the concentrating ability of the kidney tissue, irrespective of whether that functional activity be temporarily or permanently conditioned. Therefore, to evaluate the intravenous method of pyelography and to correctly interpret the results therefrom, it is of paramount importance to consider this method an excretory one and to constantly bear in mind the processes occurring in the renal and extrarenal systems, factors determining renal function. The mere non-visualization does not necessarily signify permanent renal functional inhibition, for the secretory activities of a kidney can be temporarily hindered. In addition to anatomical data derived by this physiological route, another vitally important function of the urinary tract that can be studied without the introduction of artificial means is the functional-dynamic activity of the pelvis, ureter and bladder.

Method of administration: For an adult from thirty-three to forty grams are dissolved in doubly distilled water to a volume of one-hundred cubic centimeters. The solution is filtered twice through ordinary filter paper and sterilized in a water bath or autoclave at fifteen pounds of pressure for one-half hour. A child of seven years receives half and a child of two years one-quarter of the dose administered to an adult. The syringe method in preference to that of the gravity is chosen in order to avoid any possibility of foreign-body reaction from tubing. Five to six syringes plus needles are sterilized in distilled water. The injection is done in two stages at intervals of three to five minutes. The first *x*-ray examination, under usual conditions, is usually made about fifteen minutes after the last injection, the second about twenty to thirty minutes after the first *x*-ray plate and the third a corresponding period after the second. The number of subsequent plates and the time at which they are taken depend upon the functional activity and derangement of the kidney. Where the function is poor, it is wise to take subsequent plates roughly at two to four hour intervals and to gage one's course according to the density of the shadow present. Experience alone can guide one.

Fig. 8. Female, 10 years old. "Pyelitis." Both sides visualized, slight dilatation and atony present. *X*-ray taken 35 minutes after injection.

Reactions: During the injection the patients experience transient thirst and generalized warmth, particularly involving the face and bladder region. Only twice was nausea transiently present. Shivering and vomiting of very short duration occurred in a case of nephrosis (case of Professor von Lichtenberg). To a child of ten (Professor von Lichtenberg's clinic), a case of bilateral insufficiency of the

ureteral orifices with well advanced bilateral pyelonephritic contracted kidneys, about nineteen grams of substance were

losis. In none were there any alarming symptoms or signs observed. It seems that Uroselectan for purposes of intravenous

Fig. 9. Male, 43 years old. Adenocarcinoma of upper pole of left kidney. Left kidney appears to be enlarged. Left upper calyx not well visualized. Right side normal. *X*-ray taken 15 minutes after injection.

Fig. 10. Pyelogram from below, of the same patient, led to the suspicion of a polycystic kidney.

administered. The child was uremic for a long time previous to the injection (RN 92 per cent). She had had attacks of amaurosis and somnolence. During the latter days there were vomiting and sleepiness. For eight hours after the injection, no reaction set in, subsequently, however, increased drowsiness and gradual cardiac failure were followed by death. Autopsy revealed a marked degree of cardiac hypertrophy, exceedingly severely infected contracted kidneys with double megaloureters. There were no macroscopic evidences of drug intoxication. Among the cases examined up to the present, there were children, old people, patients with bilateral kidney disease, patients with prostatic hypertrophy and cardiac disease, and those with active and inactive tuberculosis. In none were there any alarming symptoms or signs observed. It seems that Uroselectan for purposes of intravenous pyelography is well tolerated and yields practical results.

Its field of application becomes evident whenever ureteral catheterization is dangerous or mechanically impossible; where mechanical or infectious factors of the lower genito-urinary tract prohibit instrumental interference. In the presence of bleeding, and in cases of implanted ureters; in children, and in individuals in whom instrumentation is taxing or harmful, the clinical value of the intravenous method becomes obvious. Its application for pyeloscopic purposes will only be feasible where the density of the excreted substance is sufficient. In other words, its pyeloscopic usage will not be applicable for all cases. Where the function is poor, pyeloscopic results will be correspondingly deficient. In reading the results, one will have to con-

sider the physiological-pathological as well as the anatomical factors. Experience and adaptation will aid in the interpretation and evaluation of the roentgenologic findings attained by this method.

Fig. 11. Male, 30 years old. Hydronephrosis with findings suggestive of changes at the middle and lower calyces. Absence of visualization on the right side. *X*-ray taken 4 hours after injection.

In closing, I want to thank Doctor Stevens and the Genito-Urinary Section for the privilege extended me this evening. In addition, I wish to express my gratitude to Professors Binz, Lichtwitz, and von Lichtenberg for their help and cooperation, and to Doctors Beer and Jaches.

DISCUSSION

Dr. Beer: Dr. Swick has just presented one of the most important contributions to general medicine and to urological and general surgery to which I have ever had the pleasure of listening. The great value of this new medium is difficult to evaluate completely at this moment, but without indulging in any ecstatic prognostications as to the wide field of usefulness of uroselectan,[1] I wish to take this opportunity to cordially thank Dr. Swick for this really great contribution, and to congratulate him on finally solving this problem that during recent years has been attacked by a number of excellent workers.

Fig. 12. Female, 23 years old. Post-operative intravenous pyelogram one year after implantation of the left ureter into the bladder for a vesico-ureteral fistula. Function and anatomical relations normal. *X*-ray taken 15 minutes after injection.

My remarks I have placed on paper, both for the sake of clarity and brevity. We have just seen a series of clear pictures of the whole urinary tract made by this new method, pictures of such clarity as to be of great diagnostic value. In some of the cases, skilled cystoscopists regularly failed to obtain pictures by the usual cystoscopic methods and therefore definite diagnoses could not be established. In other cases no injections into the ureters could be made as they were implanted in the intestines. These cases show a startling conquest and clear demonstration of the value of this new method.

To one who has had many years of experience

[1] The manufacturers of uroselectan, have as yet been unable to distribute more than samples in the U. S. A.

in this line of work, the possibilities of uroselectan are enormous.

Both Swick and v. Lichtenberg vouch for its non-toxicity and its rapid disappearance from the blood. They find it intensifies the kidney shadows, appears in the urine early and in sufficient concentration to produce excellent shadows under the *x*-ray, both in the pelvis and ureter, as well as in the bladder. Moreover, depending on the renal function, the rapidity and the duration of the excretion of the iodide varies as both Swick and v. Lichtenberg have reported, and as we have seen in the films just presented tonight. An estimate of the iodide output both quantitatively and chronologically may supplement the radiographic functional test.

In view of these facts it must be evident that with uroselectan in the future the general practitioner will, with the aid of the radiologist be able to make periodic health controls of his patients, which will be accurate without relying on time honored and unsatisfactory urine analyses and palpation. In this way, lesions of a surgical character in kidneys, ureters and bladders will be spotted at a much earlier period than at present, when many patients and physicians still dread cystoscopic pyelography.

Another method of studying the motor function of the urinary tract is presented to us perhaps infinitely better than the pyeloscopy practiced at the Necker Hospital, where catheters in the urinary passages may produce all sorts of inhibitory or stimulating effects. Pyeloscopy and ureteroscopy with uroselectan may give us many interesting and valuable new viewpoints, both concerning healthy and diseased urinary tracts.

In a study of 84 cases, v. Lichtenberg states that 61, or 75 per cent gave satisfactory diagnostic data. In 22, cystoscopy with retrograde pyelography was necessary. From his study of the uroselectan, controlled by the usual cystoscopic methods he believes he may conclude:

A. Absence of kidney shadow means (1) no kidney (agenesis), or (2) almost functionless kidneys.

B. Absence may also be evident in extensive tumors, pyonephroses and badly infected obstructed kidneys.

C. Also in bad heart disease with insufficiency.

D. Also in peripheral obstruction with infection (occasionally bilateral absence of shadow). *On the other hand excellent shadows are obtained in hydronephroses, in ureter stones, kidney stones and other mildly obstructed conditions with fair or good renal function.*

Before closing these appreciative remarks, let me mention some further possibilities of this method, some of which have been touched on by Dr. Swick, and others hinted at by myself.

It is generally believed that if during a resection of the bladder for carcinoma one must sacrifice a ureter, that it does not avail anything to re-implant such a ureter in a new place in the reconstructed bladder. In view of this, many surgeons recommend ligating and dropping the tied ureter. My own experience does not bear out this viewpoint as I have seen such a kidney six years after neostomy with excellent preservation of parenchyma. One such case Dr. Swick has just shown and the study of a series of similar cases and the result of this research will be of great value, as cystoscopic control with catheterization of the re-implanted ureter is usually almost impossible.

Furthermore, there are a fair number of cases where ureters have been cut during operation and have been subsequently re-implanted, the duration of life of such kidneys and their functional activity can probably be studied by the uroselectan method much better than by cystoscopy. We have a series of such cases for Dr. Swick to work on. In addition, cases with ureters implanted in the intestine, such as have been shown tonight, can only be studied and controlled properly by some such method as Dr. Swick has described. Patients who have had pyeloplastic procedures and ureter implantations into the pelvis will also lend themselves nicely to this method. Above all, patients that are not fit for cystoscopy, or who object to the usual repeated retrograde pyelographic methods will benefit by this great improvement.

In closing I must admit that I have been thoroughly stirred by Dr. Swick's excellent work, and congratulate him again, and all of us and our future patients in that he has found the path to successful intravenous pyelography.

Dr. Abraham Hyman: We at Mount Sinai Hospital who have been fortunate enough to follow Dr. Swick's work are just beginning to realize the value of his method of pyelography. It not only opens up new vistas, but will undoubtedly place urological diagnosis on an even more accurate basis than it is at present.

Dr. Beer has already called attention to its possibilities in the field of general medicine and surgery. It appeals to one from many points of view. In the first place, it is an entirely physiological procedure outlining both kidneys, the ureters and bladder from above, and does away with artefacts caused by retrograde pyelography. It also settles once and for all the question of simultaneous bilateral pyelography, a matter which has given rise to considerable adverse criticism during the past few years.

Intravenous pyelography offers an excellent method of studying dynamic conditions within the pelvis and ureter, and from what we have observed so far also gives us a radiographic functional test. To interpret radiograms taken in this way we must, however, change our concepts to some extent. The kidney shadow itself shows up more intensely than in the ordinary pyelogram, although in general the pelvis and ureter are not as distinctly outlined as they are with retrograde pyelography. In the presence of obstruction in the ureter or pelvis the intravenous pyelogram is more intense than in non-obstructive conditions. Its success depends, of course, upon the functional activity of the kidney, a non-functioning organ not being visualized. While this usually denotes anatomical destruction of a kidney, in one case of calculous pyonephrosis the opposite apparently healthy organ failed to visualize and thus brought up the question of the proper interpretation of the absence of a shadow should a kidney be reflexly inhibited. This patient died from uremia following a suprapubic cystotomy for stone performed under local anesthesia. The blood chemistry just before death was considerably elevated although it had been normal prior to operation. Undoubtedly the failure to visualize the kidney was due to a non-functionating organ, and not to a reflex inhibition.

We have had the opportunity of studying by this method a number of selected cases which presented unusual difficulties in diagnosis, and have found it of great value. In several instances the ureters could not be catheterized and the data obtained by intravenous pyelography was of considerable aid in determining operative indications. In a case of ureterocele which had been fulgurated previously a number of attempts to introduce a ureter catheter had failed. No indigo carmine was observed coming from the region of the ureter orifice. The question arose as to whether this was a functioning kidney, and intravenous pyelography distinctly showed a moderately hydronephrotic kidney with a ureter outlined all the way down to the bladder. As a result, it was decided to attempt a plastic operation on the lower end of the ureter, which proved successful.

To what extent this method will supplant retrograde pyelography cannot be determined at present but, briefly, it should prove of considerable value in such instances as the following:

The many cases which cannot be cystoscoped or in which the ureters cannot be catheterized for one reason or another.

It will probably bring to light many unsuspected anomalies of the urinary tract.

In urological conditions in children, where it will be especially valuable.

In elucidating many problems which we have hitherto been unable to clarify, notably the dynamics and function of the kidney and ureter after implantation into either the bowel or the bladder.

It will probably supplant retrograde pyelography in tuberculosis of the urinary tract, as in these cases there has always been the danger of unpleasant reactions.

It may help to clarify the situation considerably as far as ureteral strictures are concerned.

In prostatic cases it will undoubtedly assist in demonstrating the condition of the upper urinary tract without resorting to ureteral catheterization.

In closing, let me extent my heartiest congratulations to Dr. Swick for this most valuable contribution to urology.

Dr. Swick, closing: Experience up to the present has not been sufficiently large to permit drawing any conclusions concerning the visualization of uric acid stones by means of this method. Further study is necessary. Compression from without by means of a rubber bag for about 5 minutes prior to the *x*-ray and then its removal when using the *x*-ray seems to yield denser pictures.

My experience concerning the restriction of fluid has not been very great, but it seems that it is wiser to permit relatively large quantities of fluid the day previous to the injection. These are points in which we are interested and continuing further studies.

It is important in evaluating and interpreting the results from the standpoing of function, to bear in mind that the functional activity of a

kidney can be temporarily or permanently inhibited and the mere non-visualization at a particular examination does not necessarily mean a permanently damaged kidney. I am referring particularly to a case of two-day anuria, during which time an intravenous injection yielded negative results. Two weeks later, however, when the function from both sides was normal, a repeated intravenous pyelographic test yielded positive results.

ROENTGEN STUDY OF APICAL CHEST TUMORS*

W. F. Henderson, M.D., F.A.C.P.

NEW ORLEANS, LA.

CERTAIN types of tumors located within the chest are sufficiently numerous to deserve a more careful study than has usually been accorded them. The metastatic malignancy involving the pulmonary fields, with its balls of cotton fluff, and the massive or infiltrative carcinoma from some remote primary focus, involving the parenchyma in a widespread involvement, as well as the primary malignancy within the chest, are matters of frequent occurrence in any busy hospital department. The primary carcinoma of the lung originating at the hilum and spreading fanwise in its invasion of the pulmonary fields presents a picture which offers little or no diagnostic difficulty and early becomes familiar to the students of roentgenology. The type of tumor, however, which we wish to present cannot be demonstrated as having origin in the mediastinal structures or the region of the hilum, apparently originating in the apex quite independently of these structures. Pancoast[1] has called attention to several of these neoplasms, and recorded a very excellent review of the clinical, radiologic and pathologic aspects of the subject. It is his opinion that the majority of these have fallen under the classification of primary endothelioma of the pleura, although, as he states specifically, certain of these tumors, lacking necropsy reports with microscopic findings, can only be so classed in view of their distinct similarity to others which have been fully proved. In our own cases also it is unfortunate that necropsy findings cannot be furnished upon all cases and, along with Pancoast, we again only assume that the similarity of the clinical manifestations, negative physical findings and uniform roentgen-ray observations, which form the basis of the opinion, render these tumors most probably members of the same group in which necropsy has proved the correctness of the opinion.

Roentgenologically, the major facts connected with these tumors seem to be their uniform location in the apex of the chest where they are completely isolated from the hilum, and, since they are not of mediastinal origin, have no tendency to displace the trachea, as is so commonly seen in other types of tumors. Characterized by a lower border which is very sharp and usually almost perfectly straight, there seems to be little or no tendency to invade the subjacent lung tissue, while the tumor as a whole presents a uniform density, quite unlike the mottling or ramifications of the lesions of tuberculosis.

Beyond the lesion in the apex, the chest usually presents no shadows of interest, thus causing the large fan-shaped tumor to stand out all the more distinctly by contrast, while the infrequency of metastasis to more distant locations, and the absence of the habit of forming fluid (characteristics so common in other chest tumors) serve still further to set these

[1] Pancoast, H. K. Importance of careful roentgen-ray investigations of apical chest tumors. *J. A. M. A.*, 83: 1407–1411, 1924.

* Submitted for publication December 18, 1929.

apart in a separate group of their own. Neither in Pancoast's series nor in my own was fluid observed in any case.

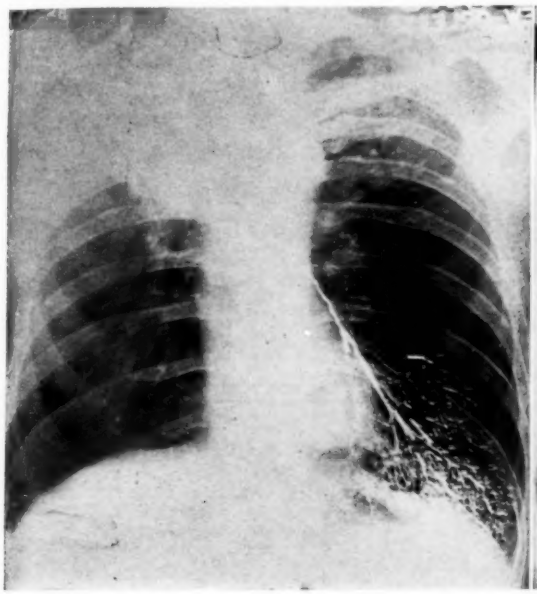

Fig. 1. Tumor in right apex. Left base injected with lipiodol.

Fig. 2. Same case as Figure 1. Both bases injected with lipiodol. Secretion from bronchiectasis filling bronchi on right. Tumor in right apex. One month after Figure 1.

A diffuse thickening of the pleura from a previous inflammatory process may possibly serve to confuse, but since this is almost certain to exhibit a reflection off the chest wall at some point near its margin, the differentiation should not be difficult. It may be safely assumed that a tumor which conforms to the dicta just set forth will in all likelihood fall into the classification of pleural endotheliomas.

To this may be added the two outstanding clinical observations: viz., increasingly severe pain in the shoulder, radiating down the arm; and the suprising disproportion between the magnitude of the roentgen findings and the physical signs which can be elicited. In fact, one of the most astonishing aspects of the whole business is the paucity of physical findings during the course of an examination. It has been our experience that under the most careful and skillful physical examination by undoubted leaders of the profession, the ordinary changes of dullness and alteration in breath sounds almost uniformly have been absent, so that one can easily pardon the look of incredulity on the face of a clinician and understand his hesitancy in accepting the findings when the roentgenogram of such a condition is exhibited for his inspection. It seems almost incredible that these tumors should escape detection by ordinary methods of examination, especially when their magnificent sweep is exhibited upon the roentgenogram.

That not all tumors of the apex fall into this classification is of course obvious; we have no intention of contending upon this point. That tumors arising from the mediastinum and extending toward the apex are not characterized by the dicta which we have set forth is frequently illustrated. Reference to Figures 9 and 10 in a suspected case of pleural endothelioma, shows very clearly that this does not have the uniform density, the straight lower margin and the other characteristics which have been described as peculiar to the condition under discussion.

An observation about which no very strong feeling is had regarding its value as a prognostic sign has occurred with

sufficient frequency to justify its discussion. Shortly before death, from three to four weeks, these tumors have exhibited a tendency to break through the lower margin and to dip down into the structures immediately beneath. In three instances occurring in this series, this has taken place without any demonstrable metastasis to other neighboring or distant organs. That such metastases have occurred, however, cannot be controverted; and, in the light of our deficient autopsy findings, we cannot feel too strongly upon this point, contenting ourselves only with the view that no demonstrable lesions were visible at any point in the osseous system or lungs and that no enlargement of the abdominal viscera could be had. It is likewise true that no symptoms causing suspicion of metastasis to the brain appeared in any of our cases before death. That metastatic invasions do occur in this type of lesion, however, is borne out in Case III. In the absence of invasion the absorption of toxic products must undoubtedly be the occasion of death, since the patients in the terminal stages present a profound anemia and cachexia.

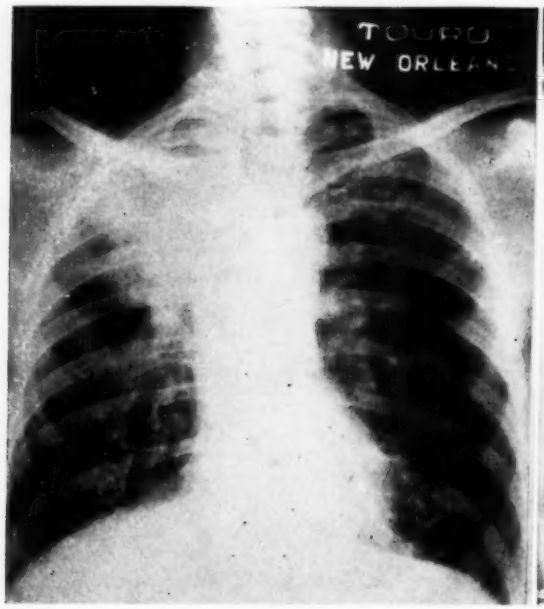

FIG. 3. Same case as Figures 1 and 2. Sixty days later. Note breaking through of lower margin of tumor. Death shortly after.

FIG. 4. Case III. Elevation of diaphragm on left side. Tumor in left apex. Clinical symptoms, pain in left arm.

In his monumental work on "Neoplastic Diseases" Ewing describes these tumors as "originating in the form of multiple nodules or flat elevations, widely distributed over either the parietal or visceral pleura, or perhaps both. These nodules or plaques fuse to form a dense firm mass which covers and compresses the lung. A serofibrinous or bloody exudate accompanies the growth, which gathers in small cysts or larger collections." This fluid does not become free in the chest, however.

Histologically the structure is rather uniformly that of alveolar and tubular endothelioma. The cells are of moderate size, of polyhedral or flat form, with hyperchromatic, vesicular nuclei and faint nucleoli. They lie in small alveoli or long single or multiple rows between cellular or hyaline connective tissue to which they are usually intimately adherent.

The question as to whether these tumors show a tendency to metastasis has had a large number of proponents on each side. That one case in my own series unquestionably extended to the cervical glands is in accord with Ewing's expressed view, wherein he states: "It

is possible that two groups of serous endotheliomas should be recognized, one invasive, with metastases, and derived from the endothelium of lymph spaces, and another, superficial, nodular or papillary, and originating from the lining cells." "All agree," says Ewing, "that the process begins over a wide area."

Fig. 5. Large tumor, right apex. Previous films show no connection with hilum. Death from endothelioma of pleura.

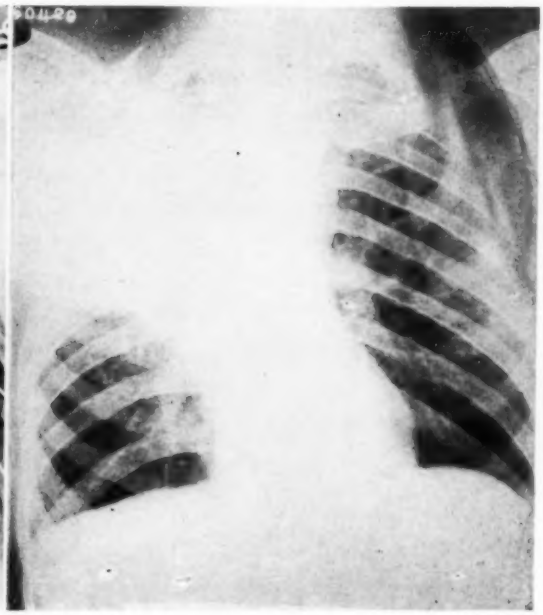

Fig. 6. Large tumor right apex, previously shown to spring from apex, without hilar connection.

The following case reports may be considered as typical for the entire series:

Case 1. Mr. A. F. A., aged fifty-nine, was seen through the courtesy of Dr. W. P. Bradburn, March 11, 1926. He had for some years at varying periods suffered from a cough somewhat intractable, more commonly observed in the morning than in the evening, and productive of a very thick, tenacious sputum. He has since childhood noted occasional attacks of semiconsciousness, with rigidity of many muscles in his body. The remainder of the history is without particular interest, other than that the productive cough has been characterized by numerous physicians as bronchiectasis. At the time of the examination, the patient states that for the preceding six months there had been a pain, increasing in severity, in the right shoulder, above the right clavicle and down the arm. This had increased in intensity and it was for this condition that he applied for relief. The blood pressure was noted as 124/80. The heart was declared to offer no clinical evidence of disease. Over the base of the right lung a few râles could be heard: the breathing was cavernous in type, so that the diagnosis of bronchiectasis, which had stood for some time, was concurred in by Dr. Bradburn. Upon more careful questioning, a history of intermittent hoarseness, the duration of which coincided with the pain, was brought out and the further confidence that upon the morning of application for treatment, a small amount of blood was expectorated. At this time, the patient was referred for otolaryngologic examination, which proved to be productive of no great information, the upper respiratory tract being approximately normal. The roentgenographic examination disclosed a large fan-shaped shadow, apparently that of a tumor, occupying the upper right lung, extending from the apex down to a level slightly below the clavicle. The uniformity of its density, the straight lower margin, and the fact that this could not be demonstrated as arising from the mediastinum, brought forth the expression of an opinion that this was in all likelihood a primary endothelioma of the pleura. (Fig. 1.) A bronchoscopic examination by Dr. Lynch demonstrated a fairly large quantity of mucus coming from the bronchus of the middle and lower lobe, but apparently

none from the upper lobe. The instillation of lipiodol into the lower lobe elicited the shadows produced in Fig. 2, in which the lipiodol is observed to come to rest in the larger bronchi, apparently being arrested upon the level of a fluid occupying these bronchi so that the bronchioles and alveoli are not filled with this substance at any time. Upon the left side no such bronchial filling has occurred, thus allowing the lipiodol to find its way into the bronchioles and alveoli.

Fig. 7. Case 11. Moderately early recognition of tumor in right apex. Not connected with hilum.

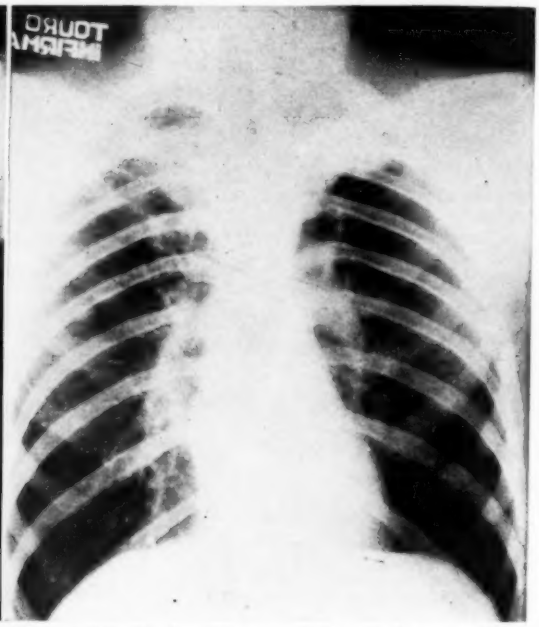

Fig. 8. Typical appearance of apical tumor in moderately early stage. Tumor in left apex.

Repeated *x*-ray examination demonstrated no particular changes in the tumor until October 29, 1926, at which time, as observed in Figure 3, a breaking-down of the lower margin and an invasion of the lung tissue at a lower level is seen to have occurred. At this time the pain had greatly increased, particularly down the arm, and a division of the posterior roots was contemplated for relief of pain. Aphonia by this time had become a very definite and distressing symptom. This patient, however, came to his end before a surgical procedure could be undertaken. At no time during the course of the observation was it possible to demonstrate ocular changes.

Case 11. Mr. R. M., aged thirty-eight, was seen through the courtesy of Dr. I. I. Lemann. The patient presented himself on January 19, 1926, complaining of pain in the chest. The pain began to be noticeable in August 1925, occurring at intervals and was associated with some muscular twitching at the time of the pain. For the past 2 or 3 months, the pain had been very constant and increasing in intensity. Aspirin at the beginning proved beneficial in 5 grain doses but at the present time 30 grains proved necessary even for moderate comfort. The pain had remained confined to the right chest and down the right arm, the principal point of the pain being above the 4th rib. Prior to coming under our observation, both fluoroscopic and film examinations had produced the report of: "increased density in the right apex, uniform in type without mottling, associated with enlarged peribronchial glands on the right, with a normal heart and aorta. The probability of tuberculosis seems evident."

The general appearance upon presentation to us was of a fairly well nourished, rather sallow anemic individual, 5 feet 5½ inches in height, weight 119¾ lb.: the heart rate was 80 and upon percussion exhibited normal size and outline. The abdomen was without interest. The pupils were equal, regular and symmetrical, reacting to light and accomodation. The knee jerks were lively and there was noted at this time a marked clubbing of the fingers. The pulmonary examination disclosed an occasional sonorous râle heard upon the right side over

the major portion of the upper half of the lung, and extending out to the axilla. No crepitant or subcrepitant râles could be elicited; there was a minor amount of dullness over the right lung in the supraclavicular spaces as low as the 2nd rib anterior and posteriorly as low as the 5th dorsal spine. Over this area there was likewise a suggestion of bronchial breathing.

Fig. 9. Tumor of apex suggestive of endothelioma of pleura, except for connection with hilum and fluid formation in right base. See Figure 10.

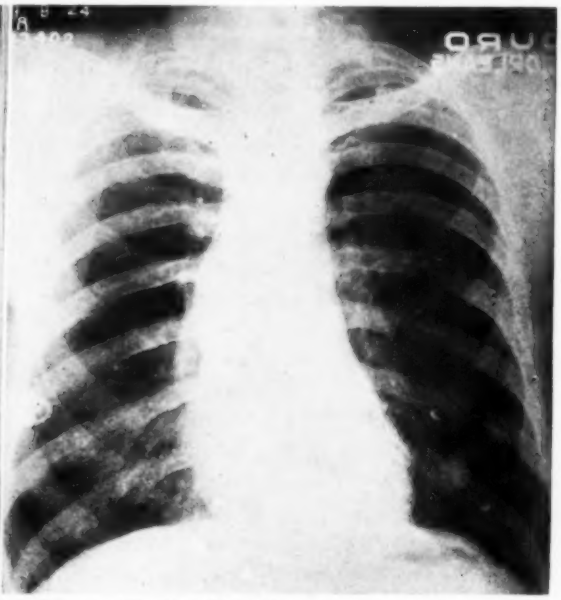

Fig. 10. Earlier film of same case as Figure 9. Tumor springing from right hilum.

The patient passed through my hands on January 19, 1926, at which time there was observed a large shadow occupying the entire apex, uniformly dense and somewhat triangular in shape. The lower margin was quite sharp and regular. The homogeneity of the shadow together with its size, position and lack of involvement of either the contiguous or opposite lung tissue was considered to be very suggestive of neoplasm rather than tuberculosis. Further study upon Feburary 18, 1926 failed to disclose any evidence of osseous erosion either in the spine or ribs, nor could evidence of change over the previous roentgenogram be observed. Passing from under our observation, we have a note of March 5, 1926 in which the patient states that "the pain seems to have increased both in intensity and in area. It goes over the chest, down the right arm almost to the elbow, being most intense in the chest just above and to the left of the right nipple, in the armpit and a point mid-way between the arm pit and elbow;" while a further note dated March 11 states that "the pain is still increasing." Morphine was shortly resorted to pending the division of the posterior roots for relief of pain, but on approximately the 1st of May the picture was terminated by death, the death certificate bearing the notation "carcinoma of the lung."

Case III. Mr. A. N. M., aged thirty-five, a telegraph operator by occupation, presented himself upon January 14, 1926, complaining of pain in the left shoulder and down the left arm. Approximately four months previous to admission, his attention was called to a stinging, burning pain extending from the shoulder down the arm to reach its point of greatest intensity at the left elbow. Since then this had proceeded down the dorsum of the forearm to the ring and little fingers, and there has been a sense of weakness in the left hand. There now appeared to be a small mass not at all sensitive and considered to be enlarged lymph nodes on the left side of the neck. There was no pain in the neck at any time but there had been a gradually increasing hoarseness for which the patient could not account. The appetite was unusually good and there had been no loss of weight. Aside from the usual diseases of childhood, the previous history was without interest except for an attack of right-sided pneumonia in 1910 which was

uncomplicated. The examination of the nose and throat were without interest, and particular attention is called to the fact that no eye symptoms could be observed. The abdomen was likewise without interest, as was the heart; the examination of the lungs was stated to disclose no evidence of pathology upon either side, and to demonstrate normal breath sounds; that the diaphragms expanded in normal manner; and that, with the exception of a few muscial râles in the left chest, heard intermittently, there was nothing in the chest to attract attention. The pain in the shoulder and down the arm was considered probably dependent upon cervical ribs, examination for which he was referred to me on January 15, 1926. Figure 4 illustrates the condition found at this time. It is scarcely probable that the elevation of the left diaphragm could account for the discomfort down the arm, this being much more probably accounted for by a shadow of uniform density and with straight lower margins without infiltration of the adjacent structures, which is seen to occupy the upper portion of the left lung. A section removed from the tumor in the neck (lymph nodes) brought from the Department of Pathology the diagnosis of neoplasm of the endothelial type, secondary to a primary focus. Further observation was precluded following the patient's leaving the hospital but a subsequent note states that the patient succumbed, the death certificate giving as a primary cause of death, new growth of the left lung.

Contrary to the findings of Pancoast we have observed little or no ocular symptoms, and likewise, contrary to his findings, our cases have been almost uniformly attended with hoarseness, advanced in certain cases to the degree of aphonia. The observation of erosion of the ribs and vertebrae on the affected side in his cases which presented ocular symptoms would seem to offer the explanation, since the muscle of Mueller, which is the accessory elevator of the lid, receives its major nerve supply through the sympathetic system, this no doubt being involved in the process when extension has become sufficient to produce an actual destruction of osseous tissue. The absence of ptosis of the lid in my own series is therefore compatible with the fact that we were unable to observe erosions of the contiguous bones at any time.

This series to date comprises a total of 8 cases, of which 7 occurred in adults. The ages in the adults lay between the extremes of eighteen and fifty-nine. A single case occurred in a child of two and one-half years which conformed so closely to the changes in the recognized cases that there should have been little doubt as to the true nature of the tumor. This unfortunately escaped detection until the necropsy brought to light the exact pathology. Had I at the time been aware of Hibler's case described by Ewing, occurring in a child of five years, such chagrin might possibly have been avoided. With the exception of the very youthful patient, the series is represented entirely in the male sex who have come from separate sections of the state, and of widely varying occupations. Necropsy reports upon 4 of the 8 cases presented give the cause of death as primary endothelioma involving the pleura. Unfortunately, the remainder of these cases originated in neighboring towns, with death occurring at home, so that no necropsy findings are available for inclusion in this report.

PRACTICAL CONCLUSIONS AS TO THE NATURE AND BEHAVIOR OF GRENZ RAYS (BUCKY)*

DR. MED. B. SPIETHOFF

JENA, GERMANY

GENERAL CONSIDERATION

WHETHER the introduction of the "grenz ray" into practice constitutes a marked advance depends upon whether the tolerance of the skin for these rays is judged greater than its tolerance for the roentgen ray. Since the comparison greatly favors the grenz ray, its excellence in skin therapy, taking similar results for granted, points in two directions. The first leads to a field already conceded to the roentgen ray, although its tilling was not always as fruitful as could be wished since the narrow margin of skin tolerance tied the therapist's hands. It is precisely in this that the grenz ray impressed me at once as significant, for it was possible to expose diseased skin to the alterative effect of the grenz rays for as long as was required to relieve the skin of its perverted form of reaction.

The other direction leads to new territory. The means for administering greater amounts of radiation at a single exposure, and, if necessary, for a long time, opens up a field of work the results of which may be predicated by the possibilities. My reflections relate preeminently to pigmentary nevus, vascular nevus, cavernous angioma and lupus vulgaris. This possibility of employment for the grenz rays is based upon a quality of radiation which excludes injury. According to our experience a tension of 9 kv. max. is recommended. Exceptionally, and only in special cases, as simple sycosis, skin cancer or epithelioma, and in general irradiation, as recommended by Bucky, we use 11 kv. max.

We determine dosage by means of Kuestner's dosimeter in terms of R units, the dosages varying from 70 to 11,000 R. The tube-skin distance is 2 to 70 mm. The size of the field irradiated varies directly with the distance and has a diameter of from 20 to 70 mm. with our technic. Results as well as prevention of unfavorable effects depend on exact control and continuous corrective regulation of the entire apparatus. The grenz-ray therapeutist, like others, must master the technic and physics of this method, and must not be careless because the danger is less.

From the onset the importance of exact dosage was obvious to us. For this reason we designedly worked out the precise physical fundamentals from the beginning. Dr. Kirsch, an assistant in my clinic, and Dr. Gfroer, a physicist, developed in the physical laboratory of my clinic a system of measuring, which has met all requirements. Bucky's approval, when visiting our clinic, was of great satisfaction to us. The essence of the method is the determination that each apparatus actually presents the kilovoltage at the tube which is claimed by the manufacturer. These conditions must be controlled continuously. Kirsch tests this out with a large Hartman and Braun kilovoltmeter in connection with a large hot cathode valve tube. But individual tubes may vary considerably in their ray intensity in spite of equal tension (construction of tube and thickness of Lindemann window). Therefore the output of the tube must be determined exactly. The best way is to check *and* control the energy in R units by means of an ionometer. We use Kuestner's device for this purpose.

General therapy, as practiced by Bucky, has great and, in my opinion, growing value, just as has local treatment. No doubt, a profound effect is exerted on the entire organism, the vegetative system and duct-

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less glands, alone and in combination. In the course of general radiation, following Bucky's directions, *general* and *local* reactions arise, the former indicated by exhaustion, weariness, loss of appetite; the latter, cutaneous, through increase of the pathologic condition. As secondary effects we often observed regulation of formerly somewhat irregular menses, stimulation of the flow, a general increase of vitality of the individual, indicating a profound constitutional effect. When talking of by-effects we use this expression in regard to the skin disease which gave the indication for grenz-ray therapy, and do not consider these effects of secondary therapeutic importance.

A striking example of this sort was the case of a seven-year-old child, backward mentally and physically, dull, listless, undernourished, depressed, a poor eater. In his early infancy a skin affection began as multiple keratodermia of the palms, soles, genital region, perineum, and about the mouth. He was bald, even without lanugo. His spinal fluid and Wassermann test were negative, and the sella turcica normal. During the first series of general applications, local and constitutional reactions took place, but improvement of the general and skin conditions occurred soon after. Eight weeks later a second series followed. The local and general condition improved steadily. The boy began to eat well, became animated and cheerful. There are now hardly any pathological changes left in the skin, which never had been treated locally. The hair appeared and steadily increased.

Another case was not so favorable. The condition was similar, but more severe. The child was twelve years old when treatment was begun. The third series of irradiation brought about no improvement except in a vague general sense, greater ability to concentrate and pay attention. A previous rectal incontinence was controlled.

A case of extensive spontaneous gangrene of the skin is worth mentioning. Generalized irradiation had the effect of controlling outbreaks save for a few slight ones. The treatment is not yet completed. This patient is referred to, not as an example of a cure, but for the purpose of indicating the usefulness as to the discovery of new indications for its use. Another observation was made after intensive local irradiation in a twenty-year-old girl with severe and extensive eczema dating from childhood, not of the constitutional leptosomous type described by me, often seen in eczema, but of the athletic pycnotic sort. She was adipose; she took no further reductive diet since it had been ineffectual before grenz ray treatment. Gradually her weight dropped and stayed normal after local treatment on large fields with a tension of 9 kv. max. This must have been caused by the effect of the grenz rays on her ductless glands. The explanation might be the peculiar result of the decomposition analysis of the endocrine organs according to Abderhalden by means of the interferometric method after Loewe-Hirsch. Before the treatment the thyroid secretion is largely decomposed, but, if after irradiation the weight becomes normal, no decomposition is present.

No undesired reactions were ever observed by us with 9 kv. max. and an intensity up to 11,000 R.

In another interesting and important instance in which a pigmentary nevus had been treated with 11,000 R, ulceration took place. It differed from a roentgen ulcer by being practically painless and superficial, and because it healed completely and rapidly. At times itching, slight erythema followed by brownish to dark brown hyperkeratotic scaling, or exudative erythema occur. Such reactions may arise within from a few days to five weeks after exposure.

As to repeating treatments, I favor interruptions of one week after 230 R, two weeks after 460 R, and three to four weeks when the dosage has been greater. I never resume treatment before the reaction has disappeared.

SPECIAL INDICATIONS IN SKIN DISEASES

Eczema (subacute, inflammatory): 110 to 220 R.

Eczema (chronic): 460 R.

Pruritus with lichenification (Vidal): 460 R.

Psoriasis: 230 to 460 R.

Chronic, keratotic, thickened lesions: 920 R at times with heat (sensibilisation).

Scalp: 460 to 690 R every fortnight.

Lichen planus: Like psoriasis.

Dermatitis (active): 460 R.

Rosacea with acne: 230 or 460 or 690 R.

When there is a great deal of acne formation I use filtered *x*-rays, or grenz-rays, 11 KV tension, and about 4000 R. Recently I add, at Bucky's suggestion, general irradiation, if local does not suffice. Its influences on the flushes is excellent. General treatment is indicated. With such a procedure sometimes the reaction after local treatment fails to appear. Diet and medical treatment (aconite, sulphur) of the flushes are necessary besides.

Acne varioliformis: 460 R, diet; Alpine lamp in the intervals.

Perniones: 920 R.

Scleroderma and the sclerodermatous form of idiopathic atrophy: 1380 R.

Keloids, spontaneous and cicatricial: 2300 to 4600 R, at times with heat.

Lupus vulgaris: Simple form, 4600 R with heat or 11,000 R with intervals from two to four weeks according to reaction.

Ulcerating form, 4600 R fortnightly.

In scar tissue, 4600 R with heat.

Verrucous form, necrogenic verruca, tuberculosis verrucosa as ordinary form, 4600 R with heat or 11,000 R.

Erythema Induratum: Darier's sarcoid, lupoid Roeckt: 4300 R with heat.

Lupus erythematosus: Experiences with this therapeutically difficult and incalculable dermatosis are the same as with other methods: both unsatisfactory and excellent results. Reaction cannot be foreseen and even exacerbations might follow. I begin with a low dose: 110 R, at two to three week intervals. If necessary and possible I go up to 460 R at intervals of two to six to twelve weeks. Reactions must always be allowed to subside. Therapeutic effect often slow; therefore, patience is necessary.

Verruca vulgaris: 4900 R with heat.

Juvenile warts: 460 R. If necessary 690 to 920 R.

Nevus pigmentosus: 4600 R. Repeat till results are satisfactory.

Nevus pigmentosus fibromatosus: 4600 R with heat.

Nevus vasculosus (flat): 820 R with intervals of four to five weeks. Improvement often is delayed.

Tumor vasculosus: 1380 R.

Alopecia prematura: 460 R at intervals of four weeks.

Sluggish ulcers (irrespective of cause): 4600 R at intervals of two weeks.

Sycosis simplex: Success in my experience, as in Bucky's, depends upon whether the areas have been previously treated with the roentgen rays or not. If they have been, the outlook is poorer. 11 kv. max., 1425 R (Bucky).

Skin cancer, Epithelioma: 9 kv. max. do not suffice; 11 kv. max., 4000 R (Bucky), much better.

ENDOTHELIOMYELOMA OF THE PUBIS WITH GENERALIZED METASTASES

CASE REPORT*

CHARLES MURRAY GRATZ, M.D.

NEW YORK

THE patient, J. H., a girl, seven years of age, was perfectly well until June 23, 1928, when she slipped and fell in the bathtub, resulting in an injury to the region of the symphysis pubis. The trauma was so slight that it attracted little attention until July 10, when her parents first noticed that she walked with a slight limp, favoring the left leg. From July 13, she complained of definite pain when moving the left hip though the distress was somewhat relieved by rest.

At the request of Dr. Irving Okin of Passaic, New Jersey, I saw the case in consultation on July 15. Physical examination at that time showed slight atrophy of the upper third of the left thigh and very slight limitation of motion of the left hip with slight pain in the extremes of motion, particularly abduction and hyperextension. Pressure over the symphysis pubis elicited no pain. There was, however, a definite enlargement of the left inguinal lymph glands. The patient had been running a slight fever of about 1°F., and had a slightly positive von Pirquet reaction. The urine at that time was positive for Bence-Jones protein. The rest of the examination, carefully checked, was negative.

Dr. Okin ordered an *x*-ray examination on July 13 which showed a destructive process starting just to the left of the symphysis pubis and also extending downward on the ischium; the lesion was further complicated by the pathological fracture.

Provisional diagnosis of primary bone tumor with pathological fracture was made at the time of consultation. Other possibilities considered in making a differential diagnosis were:

1. Osteomyelitis.
2. Tuberculosis.
3. Secondary bone tumor.

Further *x*-ray films of the lungs were requested, to be followed by *x*-ray therapy. The patient was placed in a spica and kept in bed in the interval.

It is of interest to note that the films of the lungs taken at this time were regarded as negative by myself and several other doctors, but when compared with films taken October 22, it is possible that metastases noted on the later films may have been present even then.

Further *x*-ray studies were made on July 30, (Fig. 1) which were reported by Dr. R. Herendeen as follows:

The entire left pubis is the seat of a destructive process and is irregular in outline, lacking normal density. There are no localized areas of destruction or reaction and no sequestra are seen. The changes usually noted in osteomyelitis are not seen. The medullary portion of bone seems slightly widened, but the most significant finding is the diffuse infiltration which gives to the films the features frequently noted in endotheliomyeloma or Ewing's tumor. The acetabulum is clean-cut in outline, as is also the head of the femur. The epiphyseal lines in this region show no changes. In this respect, the condition does not follow the usual methods of involvement in tuberculosis. Roentgen diagnosis: Endotheliomyeloma.

Clinically and radiologically, we felt justified in making a final diagnosis of endotheliomyeloma with pathological fracture, and *x*-ray therapy, as first suggested at the time of consultation, was carried out by Dr. R. Herendeen. The details of this treatment follows:

Treatment 1, July 30, 1928.
Area, left groin anterior.
Spark Gap: 10 in.
Filter: 4 mm. Al.
Distance: 12 in.
Ma: 4
Time: 7 min.

Treatment 2, August 2, 1928.
Area, left groin anterior.
Spark Gap: 10 in.
Filter: 4 mm. Al.
Distance: 12 in.
Ma: 4
Time: 8 min.

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Treatment 3, August 16, 1928.
Area, left hip, a.p.
Spark Gap: 10 in.
Filter: 4 mm. Al.
Distance: 12 in.
Ma: 4
Time: 10 min.

Treatment 4, September 6, 1928.
Area, left pelvis anterior.
Spark Gap: 10 in.
Filter: 4 mm. Al.
Distance: 12 in.
Ma: 4
Time: 10 min.

Treatment 5, November 18, 1928.
Area, left pelvis anteroposterior.
Spark Gap: 10 in.
Filter: 4 mm. Al.
Distance: 12 in.
Ma: 4
Time: 10 min.

Record of radiation to the lungs, after pulmonary involvement was found, was as follows:

Treatment 1, November 9, 1928.
Area, left chest anterior.
Size of area, 4 × 4.
Spark Gap: 175 k.v.
Filter: 0.5 mm. Cu.
Distance: 30 cm.
Ma: 30.
Time: 5 min.

Treatment 2, November 21, 1928.
Area, right chest lower posterior.
Size of area, 6 × 6.
Spark Gap: 175 k.v.
Filter: 0.5 mm. Cu.
Distance: 30 cm.
Ma: 30
Time: 3 min.

Treatment 3, November 26, 1928.
Area, left chest anterior oblique.
Spark Gap: 175 k.v.
Filter: 0.5 mm. Cu.
Distance: 30 cm.
Ma: 30.
Time: 3 min.

Treatment 4, November 29, 1928.
Area, right chest posterior oblique.
Size of area, 6 × 8.
Spark Gap: 175 k.v.
Filter: 0.5 mm. Cu.
Distance: 30 cm.
Ma: 30.
Time: 3 min.

Treatment 5, December 1, 1928.
Area, left chest posterior oblique.

Fig. 1. *X*-ray film of July 30 showing extent of involvement at this time.

Size of area, 6 × 6.
Spark Gap: 175 k.v.
Filter: 0.5 mm. Cu.
Distance: 50 cm.
Ma: 30.
Time: 6 min.

Treatment 6, December 4, 1928.
Area, right chest anterior oblique.
Size of area, 4 × 6.
Spark Gap: 175 k.v.
Filter: 0.5 mm. Cu.
Distance: 30 cm.
Ma: 30.
Time: 3½ min.

In addition to above, radium pack was used to the left pubis by Dr. William B. Coley on December 15, 1928, as noted later.

It is interesting to note that during the first part of this treatment, there was a definite improvement in the child's condition. The cast was kept in place to prevent any possibility of further fracture, and in the latter part of August 1928, the films were shown to Dr. William B. Coley and our diagnosis was confirmed by him. Further *x*-ray studies were made on October 18, 1928 which showed a definite increase in severity of the destructive process. Accordingly, renewed examination of the lungs was made and we found that these films (Fig. 2) showed a definite pulmonary involvement. Further consultation with Dr. James Ewing as well as Dr. Herendeen confirmed the original diagnosis of endothelio-

myeloma, and Dr. Ewing advised continuing *x*-ray therapy to include the lungs, and further suggested that Coley's toxins might be of

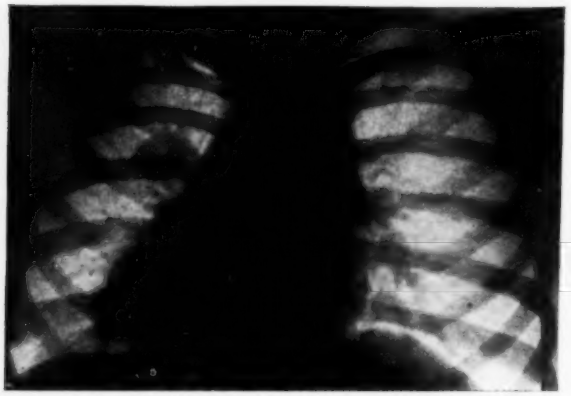

Fig. 2. *X*-ray film of October 22 showing definite pulmonary metastasis.

value in conjunction with *x*-ray therapy. The latter was carried out at the Hospital for the Ruptured and Crippled beginning October 23, 1928, after the case had been seen in consulation with Dr. Coley and under his immediate direction. Dr. Coley's report was as follows:

The toxins were started on October 23, 1928, beginning with ¼ min. gradually increasing until 3 min. were given on November 4, resulting in a reaction up to 104°.

Further roentgenograms showed no increase in the size of the tumor, but a small round metastasis appearing.

From November 9 to December 1, toxins were omitted as she was receiving *x*-ray therapy. They were again started on December 3 and continued on the 7th, 9th, 11th and 13th the last on the 18th of December, when the dosage of 7 min. was given. Radium pack was applied on December 15.

For the first two weeks, the *x*-ray studies showed some increase in both the pelvic tumor and the metastases. Films taken December 5, showed no increase in the tumors of the lungs over the ones taken November 17 (Fig. 3). On December 22, *x*-ray showed a very definite increase in the pelvic tumor, which cannot only be shown by *x*-ray but was definitely palpable. There was also an increase in size of the tumors of the lungs.

The patient lost weight steadily. General condition became decidedly worse. It was felt that nothing could be gained by further treatment of toxins and radiation. The patient was advised to be taken home and made as comfortable as possible. There was gradually increasing emaciation and the patient died on May 5, 1929.

Fig. 3. *X*-ray film of November showing marked increase in size of tumor.

AUTOPSY REPORT

Anatomical Diagnosis. 1. Endotheliomyeloma of pubis.

2. Metastases to lungs, pleurae, liver and diaphragm. Implants on bladder and peritoneum.

3. Purulent cystitis.

4. Ascending renal infection; pyelonephritis.

General. Body of an emaciated female child. Abdomen markedly distended. There was marked edema of left leg and marked emaciation of right leg. On opening the body, 1 liter of straw-colored fluid escaped from abdomen.

Bladder. Distended, contained about 500 c.c. of slightly cloudy urine.

Lungs. Studded with opaque tumor nodules varying in size from 0.5 to 4 cm. Both lungs adherent to parietal pleura, which in turn was studded with tumor tissue. The tumors were firm, opaque without necrosis, and some projected from the pleural surface in polypoid form.

Heart. Normal in size. Right ventricle slightly thickened. Valves normal.

Stomach. Negative.

Intestines. Markedly inflated with gas. Two minute skin metastases appeared over the inguinal region.

Kidneys. Pelvis dilated. Turbid, purulent urine.

Spleen. Slight postmortem decomposition. No metastases.

Liver. Much enlarged, extended completely across mid-abdomen. Two-thirds of organ replaced by tumor tissue. Gall bladder distended with fluid bile.

Gross Description of Tumor. The tumor arose in the left pubic bone, involved this bone, the ischium, nearly the whole of the ilium, the acetabulum and neck of femur; all of which were encased in the mass of tumor tissue and largely destroyed thereby. Tumor also involved the wall of the bladder, entire mass measuring 20 × 18 × 15 cm. On section it had a peculiar lobulated arrangement and the texture was of a fine, spongy character with very little necrosis. There was a pathological fracture near the head of femur.

Microscopic. Endotheliomyeloma. The tumor tissue was composed by medium-sized polyhydral and rounded cells with large vesicular nuclei which were very hyperchromatic and made up most of the cell. These cells were arranged in columns or rosettes, or they grew diffusely. The rosettes represented imperfectly formed capillary blood vessels. There was very scanty cytoplasm. Mitoses were not numerous. The blood supply was furnished by very numerous vessels of the type of arterioles. About many of these arterioles the tumor cells grew in masses of radiating rows.

ROENTGENOGRAPHIC VISUALIZATION OF APPENDICAL PERFORATION*

José Arias Avellán, M.D.

HAVANA, CUBA

AT THE suggestion of our friend, Dr. Case, we venture to offer for publication this modest contribution to radiology which at the same time serves as a demonstration of the imperious necessity of considering radiology in its proper place as a valued aid to medicine, perhaps standing first among such aids, to be resorted to always, not only in the solution of enigmas or as a recourse when all other auxilliary means of diagnosis have failed, but to correlate and corroborate the results of other investigations.

In the case which I have the pleasure of reporting, we see an excellent example of this statement that radiology should always be looked upon as the first aid in every examination.

Clinical History. B. F., white, twenty-three years of age, native of Spain. She has had two normal births and one miscarriage at two months six months ago. She has suffered the usual diseases of children: measles, whooping cough, etc.

Present Illness. The patient suffers frequently from pain in the head and very acute pains in the shoulder and in the right lumbar region. She points to the lumbar region as the source of her pain. She does not remember having passed stones nor having observed blood in the urine. The pain has been noted every six or eight months and has lasted one to three days; but with a purgative and with hot applications in the lumbar region, relief has been obtained. At the present attack the intensity of the pain grew more acute than ever before and vomiting and nausea supervened, this being the occasion of her admission to the clinic of the Hijas de Galicia.

On examination the internist gave an opinion that the patient was suffering from renal colic, for the relief of which he ordered morphine and the application of an ice bag.

On the following day, the surgeon, Dr. Rodriguez Bas, on his visit found the patient complaining of very severe pain in the lumbar region, radiating toward the right hypochondrium, with slight muscular rigidity limited to that region. Pressure did not awaken pain in the cecoappendicular region (McBurney's point) nor in the remainder of the abdomen where there was noted slight gas distention. Temperature was 38°C. (100.4°F.), pulse 120.

Examination of the blood showed 16,000

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leucocytes, of which 76 per cent were polymorphonuclears, 20 per cent lymphocytes, and 2 per cent mononuclears.

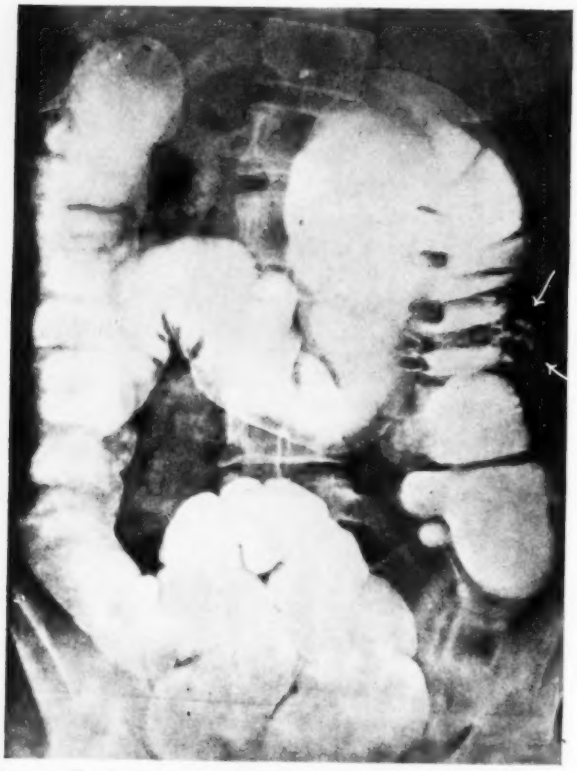

FIG. 1. Barium enema, showing at arrows barium which has escaped from perforated appendix.

Examination of the urine showed 550 c.c., containing pus cells and traces of albumin.

The patient remained in bed with ice bags, the pulse and temperature falling until they reached normal on the fifth day. The muscular rigidity having now practically disappeared, it was possible to note on palpation a deep resistance, somewhat intermittent and somewhat painful, in the right hypochondrium.

A new examination of the blood showed 7000 white cells with 48 per cent polymorphonuclears, 5 per cent eosinophiles, and 2 per cent mononuclears.

A new examination of the urine showed a specimen of 775 c.c. with numerous pus cells and traces of albumin.

Radiological Examination. Study of the urinary tract showed no suspicious shadows; in fact, nothing abnormal. The pelvis of the right kidney was then visualized with iodide of sodium and it was evident that the calices and the renal pelvis were normal and that the size, position and form of the right kidney were normal.

The patient was referred on the following day to the *x*-ray Department for investigation of a possible lesion of the small or large intestine. For this she was first given an opaque enema which was observed under the fluoroscopic screen. Imagine our surprise when, after the cecum had been filled by the enema, there was presented to our sight the astonishing aspect which is brought out so clearly in the roentgenograms which illustrate this paper. The cecum was high and fixed by adhesions. The appendix was large and retrocecal, filled for its entire extent, but permitting the escape through its distal extremity of some of the opaque liquid of the enema, the escaped barium being distributed in an irregular form radiating from the free extremity of the appendix. The *x*-ray examination was terminated with films made anteroposteriorly and posteroanteriorly and the surgeon was immediately informed that the diagnosis was acute perforated appendicitis with subhepatic plastic peritonitis.

FIG. 2. More detailed roentgenogram showing clearly appendix and spilled barium in appendicular abscess.

The surgeon ordered rest, ice bags, opium, and strict liquid diet, and so twenty days passed, at the end of which time the patient was operated upon.

Operation. Anesthetic with gas and ether. Presno's high incision for the biliary tract, extended somewhat downward. On opening the peritoneum there was noted a small

quantity of seropurulent liquid and in addition many pericolic and pericecal adhesions fixing the cecum in a high position with the appendix extending upward along its posterior aspect. When the adhesions around the appendix had been freed, it was followed down towards its base where there was encountered a perforation about 2 mm. in diameter, extending upward toward the inferior aspect of the liver. After ligating the mesoappendix the appendix was removed with a cautery and the wound closed layer by layer, placing a drainage tube and gauze down toward the inferior surface of the liver. The patient was discharged, cured, twenty-one days after the operation.

It is quite indisputable that if this patient had been examined with the *x*-rays some months previous when her only complaints were the right lumbar pains, it would have been relatively easy to have formed the opinion that the trouble was probably due to this large, long, retrocecal appendix which caused the pain to radiate into the lumbar region. This could easily have explained the symptomatology and early operation would have avoided the serious risk of life incurred by this patient.

So then permit us once more to beg of our medical colleagues that the more intimate the collaboration with the radiologists, the more surely will good results be obtained. In this particular case the patient's life would not have been placed in such jeopardy.

CONGENITAL RADIOULNAR SYNOSTOSIS*

WITH REPORT OF CASE

Edward S. Blaine, M.D.

CHICAGO, ILL.

THIS title refers to a rare developmental fault occurring in the upper forearm in an exceedingly small percentage of individuals of the human species. The condition will be of interest to the surgeon, the orthopedist, the roentgenologist, and those who are concerned with studies in anatomical detail. Having encountered one of these unusual anomalies, my attention has been focused on the subject to the extent that it seems worth while to report the case in detail together with correlated matter bearing on the subject.

This condition has also been called "congenital pronation" because of the inability of the subject to supinate the hand; in other words, the palm cannot be turned upward because the wrist is in fixed pronation. Another term given is "congenital fusion of upper ends of radius and ulna," which describes the anatomical variant.[1]

Following the advent of the *x*-ray in the investigation of the skeletal structures of the body, the presence of this lesion has been discovered in a number of instances but it was known in the pre-roentgen era through post-mortem studies. Apparently it was first discovered by Lenoir in 1817 at autopsy, according to Mouchet.[2] Prior to the discovery of the *x*-ray, there are records of 15 cases found post mortem and 7 in vivo, described by Abbott[3] in 1891. Upwards of 200 cases of this lesion are recorded in medical literature. Kienböck[4] in 1910 reported several cases, Baisch[5] in 1912 described 4 cases and referred to 38 others including those of Keinböck; Sonntag,[6] Lüdin,[7] Grashey[8] and Köhler[9] are among those who have written on this rare lesion. Boorstein in 1918 wrote on the subject.[10] The most illuminative presentation in English on radioulnar synostosis is the extensive article by Davenport, Taylor and Nelson,[11] who jointly made a most thorough excursion into various fields in the study from many angles of the 15

* Submitted for publication January 18, 1930.

cases which they found to have this lesion.

Radioulnar synostosis is a congenital fault which consists of the fusion of the upper portions of the radius and ulna in a greater or less degree of pronation due to which supination is impossible. The amount of fusion of the bones varies from 1 to 6 cm. in length in the reported cases. In a little more than 50 per cent of the studied cases the condition was found to be bilateral and occurred far more often in males than in females. In several of the cases it was found to have occurred in successive generations of a family line but a careful analysis of successive issues in other families in which the lesion occurred, failed to show such a familial sequence. In certain strains this peculiar synostosis appears to be of a dominant Mendelian character. The evidence seems to show that while its appearance does not exactly follow the Mendelian formula, it is possible that some complex variation of this theory may be involved. In one family investigated by Davenport, Taylor, and Nelson, they found the inheritance to be as shown in Figure 1, from which it will be seen that there is no regular pattern of occurrence. One female appears to have been affected in the four generations shown and one case of unilateral involvement is indicated. The extensive involvement and sequence found in this one family is not duplicated in the pedigree charts of any of the other families studied by Davenport and his associates, who found that the occurrence of synostotic individuals in successive generations is far less frequent than is recorded in this particular family.

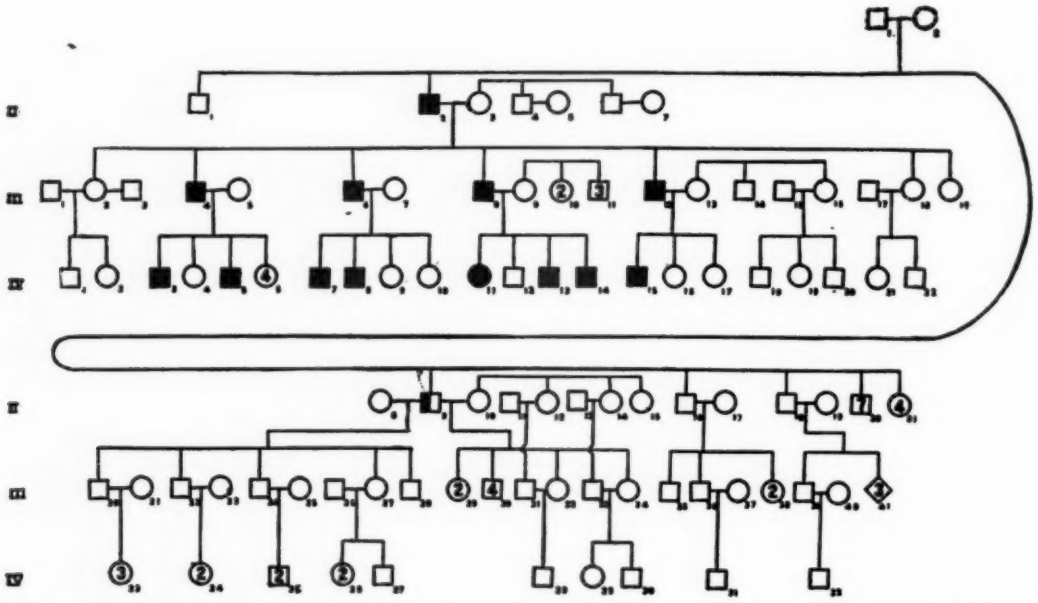

Fig. 1. Pedigree chart of M. family: Roman numerals represent generations; arabic numerals, individuals. Squares represent males; circles, females; black symbols, synostotic individuals; half-black, those unilaterally affected. Large figures inside symbols indicate designated number of that sex. Line of Generation II is carried down to second level to conserve space. (Davenport, Taylor and Nelson.)

CASE REPORT

The case which came to my notice is that of A. B. C., a graduate in medicine. He is twenty-eight years of age, white, and weighs about 165 lbs. He is of robust or stocky build. His appearance is not unusual although one may note a seemingly short neck, and the upper and lower extremities appear somewhat shorter than normal in relation to the length of the body. He is in splendid health and there is no history of a major injury to either of the upper extremities. Just prior to entering school at five years of age, a minor injury to the right wrist occurred when it was first noted that

he could not turn his hand in supination. There were no untoward events in connection with the prenatal or obstetrical periods, so far as upper, the fork being held in a vertical position. In receiving coins, etc., he cups the left hand and can thus retain the object being handled

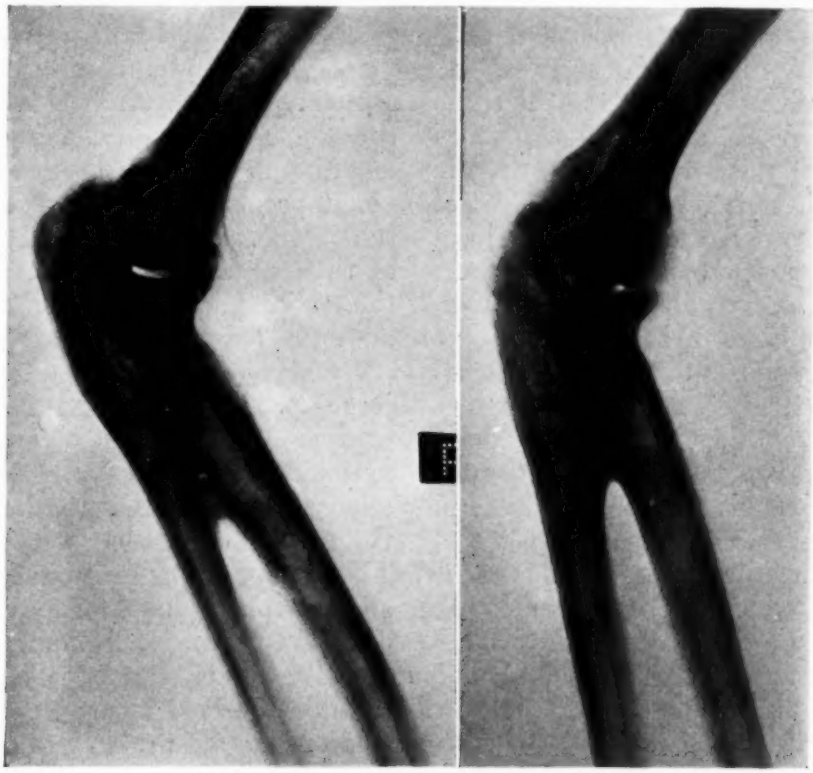

Fig. 2. Fig. 3.

Fig. 2. Right radioulnar synostosis (Author's case).
Fig. 3. Left radioulnar synostosis (reversed in reproduction, Author's case).

can be ascertained. No similar occurrences are known of in the two preceding generations. He is somewhat handicapped in that he is unable to rotate either of the forearms. The left forearm is fixed in a position midway between pronation and supination, that is, about 90°, while the right forearm is fixed in nearly complete pronation, lacking about 15°. This enables him to use the left hand to a much greater degree than the right. In writing he has relatively little difficulty in holding the pen and writes a legible hand. In eating he has difficulty in handling a spoon and fork with the right hand and holds these as does an infant, that is, sideways with the fingers folded around the handle. In loading the spoon or fork, the elbow is held high and then brought in toward the body to place the food in the mouth. In using the knife he has no difficulty but holding the fork in the cutting operation is a rather awkward procedure, accomplished by placing the thumb and little fingers on the under side and the remaining fingers on the with very little difficulty. Flexion and extension of the forearms are not restricted or interfered with. Both wrists, both hands and the fingers all function in a normal manner.

An *x*-ray investigation of the case reveals a bony fusion of the radii with the ulnae (Figs. 2 and 3). The synostosis amounts to about 4.5 cm. on the left side and 6 cm. on the right side. The bony texture is normal in every way and the union of the two bones is complete in every way. The fusion extends to the articular surfaces which are continuous. Only the outer portions of the upper ends of the radii can be recognized but no real radial heads are present. The lower portions of the radii and ulnae show no structural changes except that both ulnae are longer than normal, thus obliterating the area of the triangular fibrocartilage which is always present in the normal. No bone or joint variations were found in the neck, upper spine, lower thighs, knees or upper legs. It thus appears that the radioulnar synostosis is the only fault present.

The type revealed in this case is the deformity found in the typical cases described by most of the authors who have reported this lesion in detail. Variants in the lesion are many. In most cases the forearms present different degrees of the pronation deformity, right and left, as regards the fixed position of the hands and lower forearms; this was true in the case here reported. In most of the cases described the integrity of the elbow joint was not altered, the articulating surfaces being smooth and regular. In a considerable number of cases there was an absence of the head of the radius, this structure being represented by no more than a rounded upper end instead of the flattened knob form as seen in the roentgenogram of the normal. This has been called the "headless type."

In seeking an explanation for this peculiar anomaly, one may consider the possibility of it being an atavistic throwback, for a somewhat similar development is found in the radius and ulna of the deer. These two bones are separate in the young deer but they normally become fused in the matured animals. One may also cite a similarity in the fusion of the several bones that form the human skull where fusion and resulting obliteration of interosseous spaces are a normal sequence with advancing years. In none of the many cases reported have I found any reference to any accompanying synarthrosis of the nearby elbow joint.

A study of the two bones involved in this peculiar bony union from the phylogenetic standpoint reveals certain aspects which may have some bearing on its formation. It has been shown that the fins of fishes are the forerunners of the body appendages in man, namely, the hands and feet. In the amphibia the number of bones distal to the humerus is reduced to two, one of which, the ulna, is posterior, containing the elbow process or the olecranon, and the other, the radius, lies anteriorly supporting the carpus. It will be noted that when a child crawls prior to learning to walk, it acts as a quadruped and in so doing the radius is crossed in front of the ulna, but when it attains the erect posture, the plane of the lower ends of the radius and ulna turn outward 90°, that is, they supinate and thus assume the sagittal plane. In the ungulates, such as the horse, deer, etc., the ulna is rudimentary and, as has been noted in a previous paragraph, in the older deer the radius and ulna regularly undergo a fusion of their proximal portions. In bats, also, the radius and ulna are fused in like manner.

Embryological consideration of the subject under consideration reveals that in the earlier weeks of development of the human embryo, the arms grow outward almost perpendicular to the long axis of the torso and thus lie at right angles to it. They soon become flexed and turn medially so that the palmar aspects of the hand lie applied to the front of the chest. Thus the opposite ends of the ulna and radius become reversed in position. In this position an *x*-ray projection of the normal bones would present an appearance of fusion of their upper ends due to overlapping, while the distal ends, not being superimposed, would be seen to be separated. Thus there is a relatively close approximation of the upper ends of the radius and ulna at this stage and it is conceivable that certain postural pressures would cause an increased contact or squeezing together of the apposing surfaces of the upper ends of the ulna and radius which might result in a mutation fault of development, the two bones becoming blended where the direct contact occurred. Another angle of the situation will be recognized in the fact that both of these bones arise from a single precartilaginous unit in which two centers later appear, one for each of the two bones of the forearm. Thus a synostotic state normally occurs in the early embryonic stages of growth. The event of an incomplete separation of these two centers may explain the occurrence of radioulnar synostosis. This failure of sepa-

ration may or may not be an inherited trait; in some strains it appears definitely proved to have been inherited, but in other cases investigated it apparently is not a transmitted characteristic. In the case being reported the patient knows of no other such occurrence in his family antecedents. Being a physician, he has made a thorough study of the situation and thus we may rely on his statement that there is no other involvement in his family line.

It has been observed that in certain families in which synostotic individuals occurred in several succeeding generations they were all of short stature, while the isolated occurrences appeared in individuals who were not short or of the pudgy habitus.

In several instances of radioulnar synostosis, multiple cartilaginous exostoses were present, which condition seems to be related to the lesion under consideration but the connection is not closely defined. The occurrence of other bony defects such as club feet, club hands, absence of certain fingers and toes, fusion of fingers, etc., has also been noted in a number of the reported cases of radioulnar synostosis. Having these concomitant conditions in mind one may classify the lesion under consideration as in the achondroplasia group. This lesion is ordinarily considered as an inherited lesion but in the subject of this report, no other similar instance in the antecedents has been discovered, as already stated. In the group of cases in which heredity plays a part, the inheritance is always in the male line, and it is bilateral in about 50 per cent of the reported cases.

Note is made of the relatively greater occurrence in families in which there are consanguineous unions. Davenport et al.[11] say:

> It may be remarked that a large proportion of the families we have studied at first hand are Jewish and thus belong to a race in which consanguineous marriage is relatively common. Thus, of our 13 families, 9 are Jewish, 1 German, 1 French Irish, 1 Irish and 1 English . . .

On the whole, the evidence seems to favor the conclusion that there is some truth in all of the hypotheses and that radioulnar synostosis is a trait that, in different biotypes, depends on one, two or three factors; that it is usually an autosomal dominant (although the possibility that the gene for it may lie in the chromosome of certain families should be kept in mind), and that it is partially sex limited but variable in degree of expression, possibly owing to modifying factors.

In their summary, the same authors present the following:

1. Radioulnar synostosis varies greatly in degree. Two fairly distinct types may be distinguished; (a) the type in which the radial head is absent, the proximal end of the radius being fused with the ulna, and (b) the type in which the head of the radius is displaced toward the flexor side of the arm. The extent of the bony union varies from about 2 to 6 cm.

2. A comparative review of the mammalia shows that the radius and ulna are frequently united. This union is associated partly with their close proximity, so that any overgrowth of either bone may cause a permanent fusion of the two. When the use of the anterior appendage is not seriously interfered with, this union may become normal for a species, genus or family.

3. The radius and ulna develop out of the same precartilage plate, and, at a later stage, the perichondrium of the two bones is continuous at their proximal ends.

4. The abnormal developmental impulses which lead to synostosis are indicated by other bony defects in the propositus or his family. Among the commonest of these are; exostoses, clubfoot, and clubhand, flatfoot, abnormally diminished growth of long bones, short stature and bowlegs; in general, dyschondroplasia.

5. There are genotypical differences in the various families, which thus belong to diverse biotypes. In one family (M.) only one gene appears to be responsible for the synostosis, and this acts much as though in the Y chromosome (but this is highly uncertain). In most families, distribution is that of a two-gene trait; in one of the families, of a three-gene trait. The synostosis is always a dominant trait.

6. Males are twice as likely to be affected

as females; and this result holds for bone defects in general.

7. Frequent lack of symmetry in the defect suggest that there is frequent imperfection of dominance.

8. Consanguineous matings are found in the synostotic families; and it is probable that they are especially frequent in them.

9. Radioulnar synostosis appears to be a dominant partially sex-limited trait, which varies in degree of expression.

The essayist has endeavored to find record of successful corrective treatment for this condition but in most of the cases reported in which surgical attempt was made to provide relief, the effort proved unsatisfactory. Dawson[12] describes an operative correction in which he speaks of having obtained an excellent result by a six-step operation covering a very extended period of time.

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HEAD SLING TRACTION TECHNIC IN CERVICAL SPINE ROENTGENOGRAPHY*

Philip Lewin, M.D.

CHICAGO, ILL.

THE accompanying diagram (Fig. 1) illustrates a method of making roentgenograms of the cervical spine, which is useful in certain cases.

S. S., a man of thirty-eight years, was playing handball. He hit the ball and, in an attempt to get out of another player's path, rotated and hyperextended his head, neck and thorax. "Something" happened to his head, neck and chest. A torticollis developed gradually and in eighteen hours arrived at the stage shown in Figure 2. He had severe pain over the left supraclavicular and infraclavicular regions.

Roentgenograms were made by Dr. E. L. Jenkinson without and with traction as shown in Figures 3 and 4. The traction was obtained by tearing a longitudinal slit in a piece of muslin (see Fig. 1B). One-half was placed under the chin, the other under the occiput. Both ends were pulled upon by an intern while the exposures were made (see Fig. 1A.). Note the relative positions of the elongated transverse processes of the seventh cervical vertebrae, the first ribs and the transverse processes of the first thoracic vertebrae.

The sling may be made from a strip of heavy roller bandage about 48 in. long and 6 in. wide. A linear slit about 10 in. long is made through the middle.

The treatment indicated in this case is, very briefly: head traction in bed with the head of the bed elevated 8 in. and the application of a weight of about 12 lbs., and after a few days the application of a very high Schanz collar made of cotton, bandages and adhesive.

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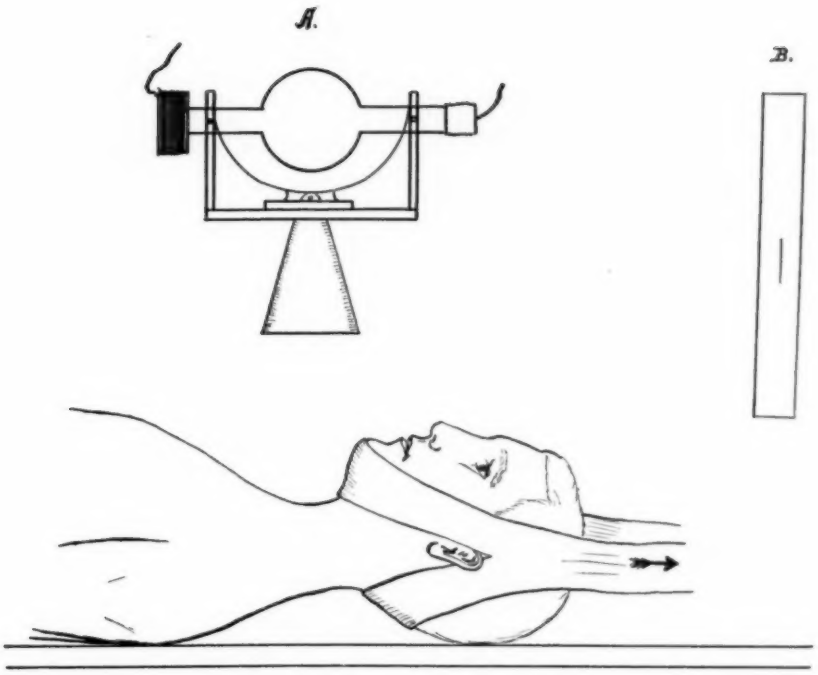
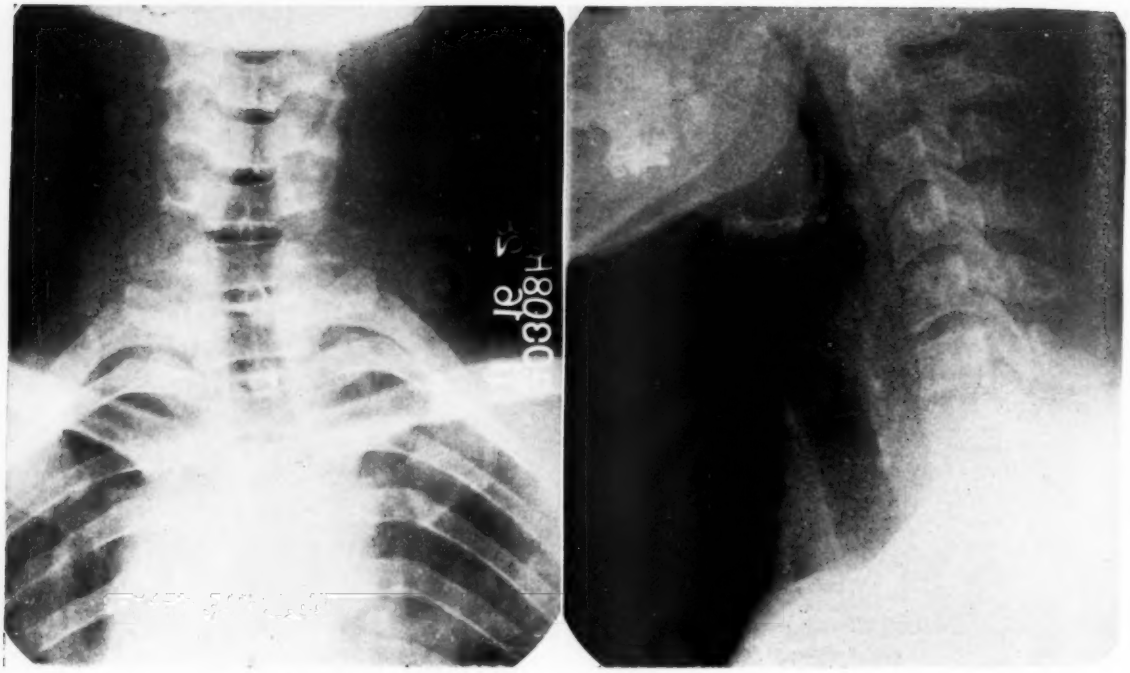


FIG. 1. A. Muslin traction in action.
B. Strip of muslin with slit.

FIG. 2. Torticollis.

FIG. 3. Roentgenogram made without traction.



A B

FIG. 4. Roentgenogram made while traction was exerted. A, Anteroposterior view. B, Lateral view.

FIG. 5. Torticollis corrected and Schanz collar, of cotton, bandages and adhesive, applied.

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EDITORIALS

THE COST OF MEDICAL CARE VS. THE VALUE OF MEDICAL SERVICE

INABILITY to differentiate between the cost of medical care and the value of medical service is costing thousands of lives and millions in money. Many who have had experience in the stock market will appreciate the vast difference that may exist between cost and value. Professional services, like some stocks, may cost a great deal and still be without value. The cost of anything is unsatisfactory unless the value is known.

The cost of medical services may be determined without a great deal of difficulty. The value cannot be estimated with similar ease. It may range anywhere from a restoration of the patient's health and vigor to a virtual death warrant. Yet the cost in each case may remain the same. For example: What is the value of a doctor's services who carefully studies a case of intestinal obstruction until it is hopeless? What is the value of his services when he appreciates the dangers of delay and relieves the condition safely? And finally, what is the value of his services when he mistakes a diaphragmatic pleurisy for an intestinal obstruction and an ill-advised operation results in an untimely death? The doctor's charge may be the same in each case.

Let us not think for a moment that the surgeon is the only one who needs watching. The American obstetrician has the highest mortality rate in the entire civilized world. We are all familiar with the studious internist who treats stomach ulcer, curing it time after time until perforation or malignancy intervenes to put an end to the tragedy. We have met the popular society doctor who treats all comers for what they have financially. Usually he treats them for not less than $250.00,

never hesitating to treat them for more if they have it. We must not inadvertently overlook the practitioner who takes a six weeks' vacation and returns a "specialist," reminding one strongly of Chick Sales' character described under the same title.

In the event the patient's malady is obviously surgical he is generously referred to the surgeon offering the largest rebate. Even in this line competition seems to be keen. One operator, I shall not call him a surgeon, is reported to have remarked: "There is no money in surgery any more because the referring doctor demands 75 per cent of the operating fee for referring the case." The man referring the case ignores the fact that incompetent surgery is taking a toll of human lives ranging from 10 to 50 per cent.

The cost of medical care has increased to an alarming degree in the past twenty years. As a *science* Medicine has made greater advances than the increase in cost. In the practice of the healing art such has not been the case. On the contrary the art of medicine has actually retrograded until the regular profession occupies a position only a little higher, on the average, than the irregular.

Only a few years ago Dr. Willis, of Richmond, read a paper before the meeting of the American College of Surgeons showing a steadily increasing mortality rate attending many of the common surgical procedures. He showed that the mortality rate attending goiter operations had increased 250 per cent; operation mortality rate for gallstones had increased 77 per cent; duodenal and gastric ulcer operation mortality rate had increased 72 per cent, and that for appendicitis had increased 31 per cent.

While on the average the work has become poorer the cost has at the same time increased. Cost is no criterion of the worth of medical care. Frequently the better paid, the poorer are the services.

The variation in the value of medical services is almost beyond comprehension. As an example: Quoting from Carr and Deacon on "Appendicitis in Michigan:" "In some counties no deaths occurred. In others it varies from 1 per cent and over. In only 8 counties was it less than 5 per cent; in 11 it was between 5 and 10 per cent; in 16, between 10 and 14 per cent; in 17, between 14 and 18 per cent, and in 10, between 18 and 21 per cent. In 10 it was 21 per cent or more." This will give an average of approximately 15 per cent. Compare this, if you please, with the mortality rate of competent surgeons which does not run over 1.5 per cent. A difference of 1000 per cent between the *average* and the *good*. In other words, there is a sacrifice of more than 13 human lives in each 100 suffering from appendicitis, and an appendectomy is a simple operation! Probably one person in each one hundred has been operated on for appendicitis within the past ten years. In other words, one million people in this country have undergone this operation during that time. If there was a preventable loss of 13 in each hundred, there was a preventable loss of 130,000 in the people residing in the confines of this country during ten years; 13,000 each year, or 36 per day. This is part of the needless cost paid in the treatment of appendicitis. No wonder the average mortality shows a greater increase in the more difficult operations of gall bladder and stomach ulcer; and still greater in that attending goiter operations where the difficulties of the operation are further complicated by the patient's poor physical condition. This needless sacrifice of human life constitutes the greater cost of medical care. The cost will always be unsatisfactory until the value is determined.

At first it may not be practical that individual mortality rates be determined for general information. It *is* essential that each hospital have its classified results available to every prospective patient. For example: The prospective appendicitis patient has a right to know that in hospital "A" there is a mortality

rate of 2 per cent while in hospital "B," which is likewise an accredited hospital, there is an average mortality rate of 15 per cent. This knowledge may be embarrassing to the hospital with the high rate but the patient whose life is at stake has the right to know.

Members of the regular medical profession has been responsible for increasing the average length of human life nearly two decades within the past half century. Shall we sit quietly by while fanatics, irregulars and incompetents nullify this splendid work so well begun.

Human life is too valuable to be squandered at the rate of 1000 per cent here and more there. The banker figures a fraction 1 per cent profit or loss. If the medical profession is going to be worthy of the confidence and trust of the people it must purge itself of the corruption and incompetency that is polluting it and costing thousands of lives.

When medical services are sold on the basis of efficiency and not by high pressure salesmanship then there will be no argument about the cost of medical care. The patient gets what he pays for and pays for what he gets.

Charles Eaton Phillips, M.D., F.A.C.S.

CLINICAL RADIOLOGY

THE work of the radiologist is not a mere technical task of producing a set of shadow records. More than most other branches of surgical diagnostic and therapeutic performance, radiology demands a preparation for the work, requiring practical familiarity with many technical and physical facts and a multitude of details of mechanical technic. For the physician engaged in the field of general radiology including both diagnosis and therapy, the requirement comes close to that paragon, the "all round" specialist, for *x*-ray methods now constitute a part of the armamentarium of almost every specialist in medicine and surgery. The radiologist does well to select a certain sphere of medical investigation for his chief endeavor.

Before commencing the strictly medical part of his work the physician-radiologist must go through a more or less mechanical procedure to produce a shadow record on screen or film. To a certain extent, but never wholly, this part of the task may be sublet, so to speak, to trained technical medical and lay assistants, and the real work of the physician-radiologist begins when the shadow record has been produced. These shadows must be translated into terms of pathology and clinical medicine; and whereas a certain part of the preliminary technical labor may be sublet to assistants here the radiologist must do the work himself, and do it as a clinician if his work is to be of real value. The greater his familiarity with the clinical aspects of the case before him, the more likely is his effort to prove worth while.

Radiological work is in large measure a consultation, though we fear it is seldom considered in that dignified light. In the ordinary consultation, as carried out in daily surgical practice, the consultant is given the advantage of all the data of history, physical findings and laboratory tests available in the case up to the moment. The consultant seeks to uncover new facts and from his experience tries either to put new construction upon the interpretation or to confirm or deny the hypotheses already advanced. How rarely is this really done in radiological practice! The age and general aspect of the patient speak for themselves, if the case is one requiring the personal attendance of the physician-radiologist, but the history and other data are available usually only by special effort, which is so time consuming

that in a busy *x*-ray department it is seldom put forth. Many referring physicians seem loath to write down a working diagnosis on the refer-blank accompanying the patient to the *x*-ray department; sometimes it is not possible to give a preliminary diagnosis. But as a matter of fact, the radiologist does not need a working diagnosis; he does need to know the motive which led the referring physician to ask for *x*-ray study.

Father would not ask Johnnie merely to go and look in the basement; he would say, he thought he heard a noise, or felt a draft, or smelled gas, or heard water trickling, or suspected a prowler, or forgot to turn off the draft in the furnace, and he would ask the boy to look in the basement because he feared such or such a thing was wrong. Or, he might tell the boy to explore the basement, not because anything was thought to be wrong, but just to make sure all was right.

Again, Johnnie might be asked to go to the upstairs front room and look—not just *to look*, but *to look for something*. However definite or indefinite the suspicion, Johnnie would be given some idea as to why he was to look.

So, in referring patients to the *x*-ray department for diagnostic work, it would be extremely helpful if the referring physician would write down in a brief sentence the real reason for the reference. A tentative diagnosis is not necessary, but a phrase or a sentence acquainting the radiologist with the problem would make the latter's work more efficient and pleasant, and result in much economy of material and time.

Some problem always presents itself to the attending physician suggesting the value of an *x*-ray study. The radiologist needs to know what is this problem. In chest cases, is the examination suggested because of a cough? Is the cough productive or not? Is there dyspnea? Is it a pulmonary or a cardiovascular problem, etc? Is there a question of subphrenic abscess? In the latter case the technic of the study will be very different from the usual chest examination. The same is true of suspected pericardial adhesions. Suspected rib fracture requires a special kind of radiographic study.

Of course in the case of Johnnie already cited, there may have been instituted in his home a formal routine of exploration of the house, and at father's behest Johnnie might make the complete round, checking up on leaking gas, blocked sewer, open windows, unlocked doors, leaking faucets, intruders, etc.; but what a lot of wasted effort in the average instance!

In the interests of more efficient radiological work, let us urge a closer cooperation between the surgeon and his radiological colleagues. Let him take the radiologist sufficiently into his confidence to briefly state his problem: the reason for sending the case for *x*-ray investigation. If, as sometimes (not often enough) the examination is being done as part of a complete physical inventory, let this be stated; the radiologist will be stimulated perhaps more than ever to extra effort to unearth some hidden and as yet symptomless lesion.

Although his duty and his pride of technical work well done require him to take an active interest in the preliminary technical work, the real function of the physician-radiologist commences with the interpretation of the shadow findings, on the fluoroscopic screen or on the films. The surgeon in his physical examination endeavors to visualize in flesh and blood the lesion he palpates. In his mind's eye he sees a cyst, a fibroid, a tubal mass, a polyp, a distended gall-bladder, not merely a tumor. Guided by the history, he interprets abdominal rigidity, epigastric and lower right quadrant pain, more or less fever, and nausea as a frank appendicitis, and in his mind he pictures the inflamed rigid appendix, possibly with fragile recent adhesion bands or gangrenous tip, and fibrinous peritoneal exudate. Similarly, the radiologist must visualize in flesh and blood what he sees in shadow: not a niche, a filling

defect, a displacement, an enlargement, a contraction, a thickening, a light or a shadow, but the actual lesions. In his mind he must picture the ulcer, the cancer, the tumor, the stricture, the cavity. This ability comes only from experience and is relatively impossible without a basis of experience in pathology or surgery. Lacking this foundation, much can be done to qualify the radiologist for more efficient interpretation by working *with* him, giving him opportunity for pathological or surgical check on his findings and aiding him in his effort to practice radiology as a clinician.

James T. Case.

INTRAVENOUS UROGRAPHY

During recent years, a number of men, including Rowntree and his associates, Roseno, Hryntschak, Rosenstein and von Lichtenberg have been striving to obtain a medium, which, injected into the circulation or administered by mouth or rectum would produce definite *x*-ray pictures of the urinary organs.

Up to date, most of these attempts at what we may call briefly intravenous urography, have failed, through occasionally in obstructed cases fairly clear pictures have been obtained. It was left to Dr. Swick of this city, while working with Professor Lichtwitz, and subsequently in von Lichtenberg's clinic, with the aid of Professor Binz and Dr. Raeth, to solve this important problem.

As a result of his work, we have an iodide compound, known by the trade name uroselectan, which, administered intravenously in non-toxic doses, produces with some regularity, strikingly perfect pyelograms, ureterograms and cystograms. The great value of this new method of exploration of the urinary tract is difficult to gauge so soon after its introduction. It is already evident, however, that uroselectan is going to revolutionize many aspects of medicine, surgery, urology, and radiology.

Edwin Beer.

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"BUCK'S EXTENSION"

GURDON BUCK was a product of New York City. He was born on Fulton Street on May 4, 1807. His father and mother were grandchildren of Governor Gurdon Saltonstall of Connecticut.

Gurdon Buck went to Nelson Classical School and finally made up his mind he wanted to be a physician. So he studied, as was the custom in those times, under Dr. Thomas Cock, and in 1830 received his M.D. from the College of Physicians and Surgeons, now a part of Columbia University. He interned in the New York Hospital. Having finished his hopital training he migrated to Europe, this being the "ultra" method of adding the finishing touches to an education, and in Europe he continued his studies in the hospitals of Paris, Berlin and Vienna for a term of two and a half years.

In 1836 he made a second visit to Europe, and in Geneva, Switzerland, married Henrietta E. Wolff of that city.

He returned to America and in 1837 was appointed visiting surgeon to the New York Hospital. This position he held until his death. He also was appointed visiting surgeon to St. Luke's Hospital and the Presbyterian Hospital at the time of their organization. In addition, Buck was visiting surgeon at the New York Eye and Ear Infirmary, from 1852 to 1862.

He was a Fellow of the Academy of Medicine from the time of its organization, and served as its vice-president for one term. He was a member of the New York Pathological Society and served one term as president. As would be expected, he was a member of his County and State medical societies.

As a surgeon he was remarkable for his boldness in operating, and the thoroughness of the detail of his after-treatment. He was particularly devoted to fractures and spent hours in the wards of his hospitals studying this type of surgery. As a result he revolutionized the current system of treatment. The improvements he inaugerated in the then-existing apparatus are brilliant chapters in surgical history.

His method of treating fracture of the thigh by the weight and pulley was at once recognized by the profession throughout the civilized world as the establishment of an original principle of great value. To this day it is known as "Buck's extension."

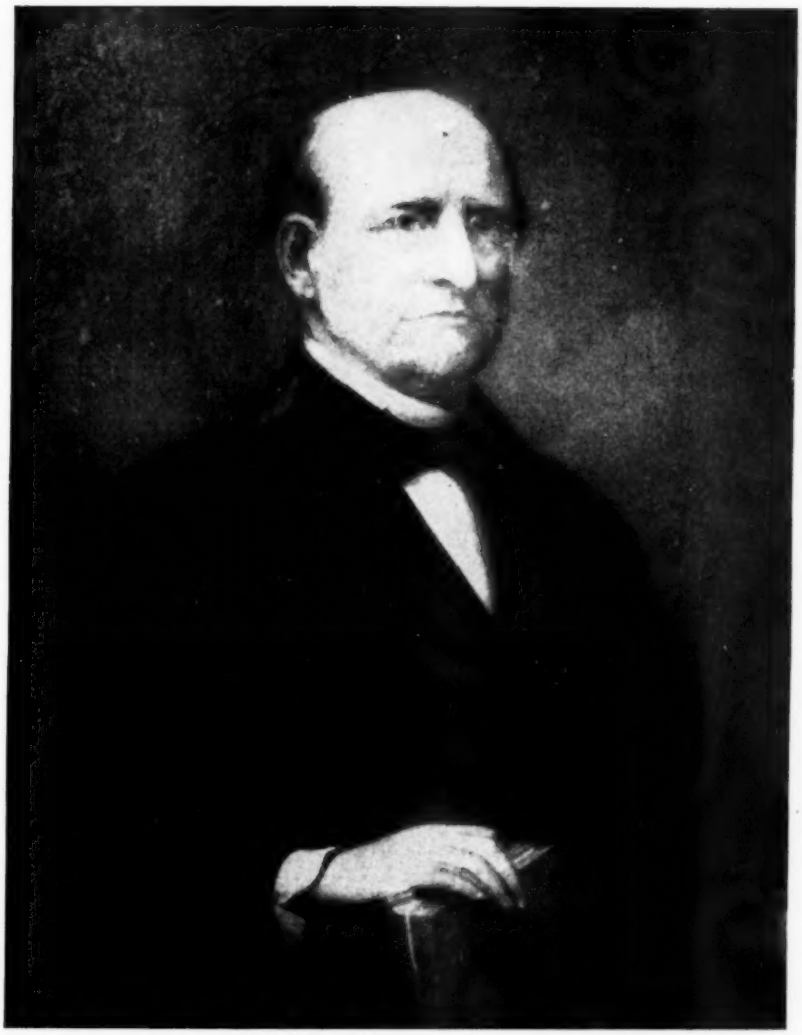
Buck's investigations with regard to the pelvic fascia are to be found in the first volume of the *Transactions of the American Medical Association*.

His joint surgery was especially creditable in a preantiseptic era. He excised the elbow joint[1] and the knee joint[2]. He was successful in treating edema of the glottis, and was deeply interested in rhinoplastic, stomatoplastic and other reparative operations, publishing a work of some 237 pages in 1876.

Buck was a very religious man, charitably inclined to the poor, and his sense of professional honor was Puritanical in its idealism.

He died of uremic poisoning on March 6, 1877. He left a widow, two daughters and three sons, two of whom became doctors of medicine.

[1] *N. Y. J. Med. & Surg.*, 1841.
[2] *Am. J. M. Sc.*, 1845.



GURDON BUCK

[1807-1877]

The American Journal of Surgery
N. S. Vol. VIII, February, 1930

[From Fernelius' Universa Medicina, Geneva, 1679.]

BOOKSHELF BROWSING

ON THE ALLEGED PENETRATION OF THE HUMAN URETHRA BY AN AMAZONIAN CATFISH CALLED CANDIRÚ

WITH A REVIEW OF THE ALLIED HABITS OF OTHER MEMBERS OF THE FAMILY PYGIDIIDAE*

PART II

E. W. GUDGER, PH.D.

NEW YORK

WHAT IS THE CANDIRÚ?

THAT there are various fishes in the Amazon and its tributaries called candirús by the inhabitants of the country is certain, and that they are nuisances, blood-suckers, either as ecto-parasites or endoparasites on fishes, beasts and man himself, is equally certain. Let us see what can be done to identify some of these candirús as members of the family Pygidiidae, and of the subfamilies repeatedly referred to.

The first teller of the candirú story is Martius (1829) who thinks our fish to be the young of either *Cetopsis candirú* or *C. coecutiens*, or possibly of a third unidentified species, a thing impossible of determination since his specimens of the last were lost. However, it is significant that he makes *candirú* the specific name of one of his fishes. Eigenmann (1918b) scouts the Cetopsis-Candirú idea for, although this fish is called by that name, it grows to be at least a foot long and 2 inches thick. However, Martius indicates that he suspected the *young* of some species of this genus, and Mr. John Tee-Van collected at Kartabo, Mazaruni River, British Guiana, in 1919, a little Cetopsis 28 mm. long and 3.5 mm. in greatest diameter, small enough easily to have penetrated the human urethra. Presumably these fish are not parasitic, but it should be noted that the Cetopsidae and the Pygidiidae live in the waters of the Amazon and hence the young cetopsids might easily consort with and be captured along with the pygidiids.

In the search for all the first-hand information possible about the candirú, I was referred to Dr. Alfredo da Matta of Manaos, as the outstanding physician of that part of Amazonia and a man much interested in natural history. I asked him for data and his long letter to me (which will be frequently referred to) shows a large acquaintance with the candirú and

* Part I appeared in Vol. 8, No. 1, p. 170, January, 1930.

associated fishes, and has thrown a flood of light on various points. Among other things, he thus clears up the matter of Martius's candirú:

> The Candirú must not be confused with the Candirú-nassée. The Candirú is a small fish . . . without scales, of the genus *Vandellia*, family Trichomycteridae [Pygidiidae]. The Candirú-nassée, while it is also scaleless, reaches a much larger size, and is the common name of the species, *Cetopsis coecutiens*.

To return to the chronological order, the next account is from Poeppig (1836) who collected numbers of his candirú in Yurimaguas. His only preservative was the raw spirit of the country distilled from the juice of the sugar cane, and in this they unfortunately spoiled. However, examination of the figures in Spix and Martius showed him that his fish was quite unlike theirs. One can only conjecture that his candirú was a *Vandellia* or a *Stegophilus* since *Branchoica* has thus far not been taken in the Amazon basin.

Castelnau (1855) gives a colored figure of his candirú (identified as *Trichomycterus pusillus*) marked natural size. It is about 145 mm. (5.75 in.) long. This figure shows the operculum well provided with large spines. Eigenmann renames this fish *Pareidon microps* Kner, and his figures show the opercular spines fitted for holding the fish in position, while the maxillary and mandibular teeth are possibly adopted for scarification. However, its considerable size and its terminal mouth hardly adapt it for endoparasitism. It is undoubtedly carnivorous and possibly an ectoparasite, but hardly an endoparasite unless when young. It does not seem worth while to figure it herein.

Wallis (Müller, 1870) collected a candirú in the Huallagua and sent it to the Leipzig Museum where it was provisionally assigned to the genus *Trichomycterus* or to *Stegophilus*. In 1888 Leuckart loaned it to Lütken who after a careful study decided (1891) that this fish was a new form and gave it the name *Acanthopoma annectens*. The name still stands, and inspection of Lütken's figures (Figs. 1, 2, and 3 herein) leads to the conclusion, based on the slender form, the spinous opercles, the shape and form of the ventrally placed mouth, and the teeth, that the fish (100 mm. long) is a blood-sucker, a candirú.

Boulenger's (1898a) specimens, sent in by Dr. Bach from the Rio Jurua, were found identical with those sent to Lacépède from Lisbon in 1808 by Prof. Vandelli (*Vandellia cirrhosa*) without indication of their source, but, as we now have every reason to believe, coming from Brazil. As the figures (4 and 5) show, we have here a slender fish with retentive opercular spines, with premaxillary teeth fitted for rasping and with a suctorial mouth. It is easy to believe that this "Candyrú" is also a parasite, and, as the ventrally placed opercular spines show, one not necessarily confining its operations to the gills of fishes.

After his interesting experience (see Part 1, p. 175) Jobert (1898) collected at Pará in 1877 some of the lesser candirús by the turtle-shell method, and took them to the Museum d'Histoire Naturelle in Paris. In 1911 Pellegrin examined these specimens and found them to be *Stegophilus insidiosus*, the very fish of which Reinhardt wrote so interestingly in 1859, and an undoubted blood-sucking parasite. It is shown herein as Figures 6, 7 and 8.

Next to be referred to is Pellegrin himself (1909a, 1909b, and 1911) who goes thoroughly into the structures of *Vandellia wieneri* (Figs. 9 and 10) and finds it a parasite. He analyzes the candirú stories and while he does not say that his fish is a candirú, it is plain that it is. And last comes Le Cointe (1922) who like the first candirú narrator (Martius, 1829) erroneously thinks that the fish is a *Cetopsis*. On this point see the quotation from Dr. da Matta (above). Unfortunately Le Cointe gives no figure.

Haseman, whose collecting experience (as noted previously) was most extensive, merely makes the general statement (1911a) that various species of pygidiids are given the colloquial name candirú. But Hase-

man's teacher, Eigenmann, in his great monograph on these fishes has gone more fully than any previous writer into the matter of what fishes are named candirú. He finds that, excepting the genus *Nematogenys* with one species, all the Pygidiidae are long slender fishes, and all have the opercle and interopercle beset with patches of spines. Further he finds in addition that all the members of the sub-families Vandellinae and Stegophilinae have the mouth inferior and the gill-openings restricted. These structures, their light (even white) color, and the known facts of their habits lead Eigenmann (1918b, p. 277) to speak of the "parasitic Stegophilinae and the urinophilous Vandellinae."

Probably all the fishes called candirú by the riverines are to be found in these two sub-families only, and of the genera and species in these we may strongly suspect that *Acanthopoma annectens*, *Stegophilus insidiosus*, and the five species of *Vandellia* (especially *cirrhosa*, *wieneri* and *sanguinea*) are the fishes called candirú by the dwellers on the Amazon. *Branchoica bertonii* is also an undoubted endoparasite, but so far as now known is not found in Amazonian waters where the candirú seems most to abound. That there is here a most interesting field for study, is clear to the reader.

IS THE CANDIRÚ URINOPHILOUS?

This is a question that must in the final analysis be answered by experiment. But leaving for consideration in the next section the question of whether or not the alleged penetration of the urethra results from a tropism to urine or from the instinct to hide, the scanty evidence will now be presented as to urinophilism.

Martius (1829 and 1831) says that "these little fish are strangely attracted by the odor of urine." Next Schomburgk (1840) was told that penetration is especially likely to take place if urine is passed while bathing. Castelnau's statement (1855) is more direct. He says that the fishermen of the Araguay "claim that it is dangerous to urinate into the river, because this little animal [*Trichomycterus pusillus*] springs out of the water and penetrates into the urethra by ascending the length of the liquid column." His words are "d'uriner dans la rivière." Whether *dans* should be translated *in* or *into*, indicating whether the body at the time is submerged or not, is determined by the context as given above.

Castelnau uses the word *prétendent*, and this may be translated claim, allege or pretend. At any rate he seemed to have had doubts and as the statement stands it is of course absolutely preposterous. However, there may be something to it after all. In discussing my paper with Mr. C. M. Breder, Jr., of the New York Aquarium, he told me that while collecting fishes in the Rio Chucunaque in Panama in 1924, he made the interesting observation that if any one stood on the bank and urinated into the stream swarms of *Astyanax ruberrimus*, a small characin fish averaging 3 to 5 inches in length, would collect and "would apparently try to ascend the stream of urine." Because of this tropism for urine, it was considered unwise to micturate while in bathing.

Tallying exactly with Breder and backing up Castelnau in general is the testimony of Dr. Charles C. Ammerman, a naval surgeon, who on the Madeira River in 1910–11 became quite well acquainted with the candirú. Prof. E. C. Starks, the distinguished ichthyologist of Stanford University, while studying fishes in the Philippines in 1926, met Dr. Ammerman and told him of my work on this fish. Dr. Ammerman then said that it was the belief on the river that the fish entered the urethra or vagina only when urine was passed while in the water. Prof. Starks wrote me that: "He said that if one urinated into the water, these fishes would come to the top and act as if crazy for the urine, the salt water."

These are the facts, the interpretation of them is another matter. Three possible explanations occur to me; that these fishes are tropic to urine, that they were

merely reacting to the current of water and would have so responded if water from the same stream had been poured out of a bucket or tea-kettle. and third that they were attracted by the noise. This will be returned to later when all the evidence has been presented, but only experiment can absolutely settle the question.

Several of the other authors cited in the first section of this paper indicate that penetration takes place while bathing *if urine is voided.* So writes Marcoy (1869), while Boulenger (presumably on the authority of Dr. Bach) says that "the fish is attracted by the urine," and Jobert was informed by his Paraense friends and by his Indians that the smaller candirú was definitely urinophilous, and this was affirmed by Dr. Castro. And von Ihering (1914) states positively that the candirú is urinophilous. The other writers quoted in the first section of this paper do not state the matter as specifically as do those mentioned, but one plainly gets the idea that all believe the fish to be urinophilous.

Eigenmann in his great monograph (1918b) speaks of "the urinophilous Vandellinae" (p. 277), and his remarks on the habits of the fishes of this family plainly indicate his belief in this particular habit. Later in his paper he establishes the inclusive genus *Urinophilus* to replace the old genus *Vandellia* with 5 species. In 1922, he names a new species of pygidiid, *Urinophilus erythrurus*, from the head waters of the Amazon. From all this it is clear that Eigenmann, the authority on these fishes, believed certain ones to be urinophilous.

So far as I know but one man has actually experimented to determine the fact. Allen (1921) writes that:

> An effort was made by the expedition to confirm the widespread reputation of the candirú (carnero of Peru). A Briggs lead-in trap properly baited was frequently placed in rivers in the hope that it might demonstrate such a tropism. This was never successful.

Seeking for details of this baiting, I wrote Professor Allen suggesting that to make an absolute test of the matter it would be necessary to have a reservoir of urine discharging into the trap a steady stream, and that this urine would have to flow out of the mouth of the trap with the current, and so attract fishes facing upstream. He kindly answered that: "I merely saturated with urine rather tightly rolled pledglets of cotton and cheesecloth. These were used for bait. It may not have been as good a method as a steadily feeding reservoir of urine, but I believe that it should have answered the purpose." Whether or not candirús are known to abound in the streams where the traps were set is not stated. Certainly there is in this matter an interesting field for further experiment.

An interesting sidelight on this matter is to be found in a continuation of Mr. Breder's observations on the habits of the small characins of the Rio Chucunaque of Panama. After saying that the Indians of these parts for sanitary purposes make use of the flowing streams as sewers, and that these fishes are attracted by and feed upon human feces, he states that they are markedly attracted by flesh and blood and by human secretions in general. Specifically he added that: "In this connection *Astyanax ruberrimus*] [the small characin referred to above was noticeably attracted to the crotch and armpits of swimmers and bathers, by the abundant perspiration given off there. Here these little fishes would bite at the hairs until the men had been in the water for some time. Then when these secretions had been washed away these localized regions no longer possessed superior attractions and the little fishes distributed their tiny attacks over the whole body, particularly where there were warts, calluses, or clumps of hair on which they could lay hold." This is in accord with Martius (1831) who says: "The odor of men's secretions [he uses the plural] appears to attract the little fish."

Now it has clearly been shown above that the more specialized pygidiids are attracted by flesh and blood, that they will attack and scarify not merely the gills but the bodies of fishes, that they will attack the bodies of mammalian beasts, and that they will puncture the skin and suck the blood of man, as has been noted by Poeppig (1836), Jobert (1898) and by Haseman (1911a and b). They must be attracted to these animals, particularly to man, by the odorous secretions given off by the body. Nor does it seem too much to think that they would be attracted by the most abundant and possibly the most tropic of all, urine.

In answer to the question: Is the candirú, a pygidiid catfish, urinophilous? one must counter with the Scotch verdict: Not proven! However is seems to me that the evidence as set forth seems strongly to indicate that the candirús are tropic to urine. Additional facts to be presented in the next section also favor this conclusion. The data set forth with regard to the characins enables us to reason from analogy (a rather dangerous thing unless carefully safeguarded) but it should be stated that the characins are tropical freshwater fishes, are found in the Amazon and its tributaries, and along with the family Pygidiidae belong to the same sub-order, i.e. are fairly closely related.

DOES THE CANDIRÚ ENTER THE HUMAN URETHRA?

During the many years in which the accounts of this alleged habit have been accumulating in my files, I have been very skeptical on the subject. In considering the data one could not so readily apply the principle of cumulative evidence extending over wide regions and long periods of time, the principle made use of in my previous articles on "Rains of Fishes"[1] where the time span was 1600 years and the region covered extended continuously from Scotland across Europe and Asia to the South Sea Islands, with North and South America, and Africa also included.

In the present case our time span extends only from 1829 to the present day, an even 100 years. The regional distribution is likewise confined to the Amazon and its tributaries. The peoples too instead of being of diverse races are the mixed, but as such fairly homogeneous, riverine population of Amazonas, uneducated, superstitious, given to recitals of the marvellous, ready to credit the incredible. This recital shows my mental attitude on beginning the study of my materials. While these matters were being turned over in my mind I was working through the great catalogue of the Surgeon General's Library in search for further references on this subject, with the following results.

In the medical literature there are found scattering references to the penetration of the human urethra by leeches and insect larvae, and a considerable number of citations to accounts of the voiding with the urine of insects and their larvae and of worms. Without going into any discussion of the various ways in which these animate things gained entrance to the bladder and urinary passages, it may be conjectured that for the most part they penetrated and ascended the urethra and in the bladder laid their eggs which afterwards hatched and as larvae or imagos came out through the same urethra. One case of penetration by fishes was also noted: Jobert's, previously cited. Of the invertebrate penetrations and voidings it is interesting to note that 74 cases are specifically listed in this catalogue.

From this it is seen that certain elongate and sinuous invertebrates do penetrate the human urethra, but the persistent question is: Do the elongate and sinuous candirús do so?

In the first section of this paper all the known accounts, mainly from the writings of scientific men and of travellers

[1] *Natural History*, 607–619, 1921; and *Ann. & Mag. Natural History*, s. 10, 3: 1–26, 1929, pl. 2 text-figs.

of reputable standing, are brought together in chronological order and, on the principle that where there is so much smoke there must be some fire, they cannot be cast aside as impossible and worthless, even though individual accounts (as Lange's) are plainly not to be accepted. Let the interested reader turn to the first section and again peruse the statements made, and he will then be prepared for the evidence and argument to be set out in the next following paragraphs. This evidence is of two kinds, and the first has to do with means used to prevent the entrance of the fish.

Precautions against Entrance. Martius (1829) says that before going into the water the riverines constrict (tie) the prepuce with a string. Jobert (1898) had not been a day in Pará in 1877 when he was urged to follow the practice of the Tapuyo Indians and to wear the protective ligature. Later when he saw his Indian fishermen apply this and when he realized how uncomfortable it was he realized that these men absolutely believed in the phenomenon of penetration.

In his second account (1831), Martius represents the riverines as advising that "the organ be covered carefully" but gives no description of the protecting device. At the meeting of the Zoological Society of London previously referred to, Boulenger (1898a), in presenting the data on the habits of the candirú collected and sent to him by Dr. Bach from the Rio Jurua, states that the natives of this region ". . . rarely enter the river without covering their genitalia by means of a sheath formed of a small coconut shell, with a minute perforation to let out the urine, maintained in a sort of bag of palm fibres suspended from a belt of the same materials." Dr. Bach to make the matter clear sent to Boulenger a photograph showing two otherwise naked Indians wearing the device, but apparently did not send the device itself.

Hoping that the photograph in question was on file in the British Museum (Natural History), I wrote Mr. J. R. Norman of the department of fishes for information and if possible for a copy. Being unable to find it he wrote Dr. Boulenger, who is now living in Belgium. Dr. Boulenger answered that "So far as I can recollect after so many years the photographs . . . were the property of the Brazilian Doctor [Bach] on whose behalf they were exhibited and were returned to him." It is greatly to be regretted that these photographs were not published and thus put visibly on record.

Corroboratory of Bach's description Prof. E. C. Starks of Stanford University writes me that he has seen a photograph of such a protective device. This photograph he thinks was brought from Brazil by the late Prof. J. C. Branner, who did much exploratory work in Brazil and knew much of the habits of the people. Search has been made through Dr. Branner's photographs but unfortunately the desired picture has not been found.

There are now to be set forth certain facts, the connection of which with the matter under discussion is not wholly clear in my mind. However, there is a strong possibility that if these matters were worked out in Brazil by a competent ethnologist, they might throw a flood of light on the subject. Hence it seems advisable to set them down.

The first of these is to be found in the book (1886) of the ethnologist, Steinen, previously referred to. On page 239 in a footnote there is a description of a penis sheath worn by the Yuruna Indians on the lower Xingu, a tributary of the lower Amazon. This is cone shaped, is cut off horizontally above and obliquely below, is made of strips of dried palm leaves, and in size is about equal to the length and diameter of the two lower phalanges of the smallest digit. This presses the corpora cavernosa back into the scrotum and causes this to swell out tumor-like. Thus the penis is entirely and the scrotum partly covered by this sheath. Earlier (p. 178) and higher up the river. Steinen had

remarked on the danger to bathers of the candirú, but here as to the purpose of this sheath he says "Atque cum urethra prorsus conclusa sit, insecta intrare non possunt." This has puzzled me very much, but apparently it refers to such a matter as that referred to in the paragraph relating to citations in the Catalogue of the Surgeon General's Library.

Fig. 14. *Penisstulp* worn by men of Bararó tribe on headwaters of Xingu River. It is called *Inobá* by Indians and *Gravatá* by Brasilians. Figure is 3/5 natural size. (After Steinen, 1897.)

However, the matter was somewhat cleared up when I got Steinen's second book (1897) describing a second journey in 1887–88 to the headwaters of the Xingu. In this he goes carefully into the ethnology of the tribes of this region. He does not refer to the candirú, but he does figure and describe certain devices for covering the pudenda which seem to have some bearing on our subject.

My attention was first called to the fact that in his Figures 137 and 144 men are represented with the foreskin tied over the glans. Reference to the text showed that this ligature was applied to boys on their reaching puberty. The very idiomatic language of the text is hard to translate but it is clear that the men also wear a sheath. That worn on festive occasions is shown in his Figure 132, and has a flag-like appendage. This sheath is made of strips of dried palm leaves. The prepuce is drawn through the open point of the sheath which constricts it just as the ligature does. This is shown herein as Figure 14 and is called *Inobá* or in Brasilian *Gravatá*.

Fig. 15. *Uluri* or pudendal covering worn by Bakairi women on headwaters of Xingu River. (After Steinen, 1897.)

Next I noticed in his Figures 6 and 31 women also shown wearing a protective device. This is portrayed in detail in his Figure 43, reproduced herein as Figure 15. This object, called *Uluri*, is made of bark folded and tied as shown and is worn as shown in place in the smaller figure. Both this device and that worn by the men are very uncomfortable but seem to be *de rigeur*.

Krause, also a trained ethnologist, led an expedition in 1908, into the valley of the Araguana River, a tributary of the Tocantins lying between that river and the Xingu, whose inhabitants (as

will be seen) have the same general habits as those of the latter river. Inspection of the numerous figures in his book

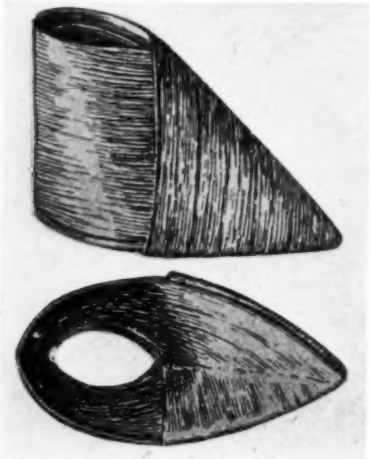


Fig. 16. Lateral and underside views of *Penisstulp* (*Imudje*) worn by men of Kanapó and Tapirapé tribes along Araguana River. (After Krause, 1911.)

(1911) showed the same ligated prepuces as portrayed by Steinen. Among the Karajá, the assumption of the penis string marks the age of puberty. This was also true of the Savajé. Some of the Karajá men also wear a penis sheath. On the other hand among the Kanapó the penis sheath is assumed at puberty. This, called *Imudje*, as shown in Figure 16 (his Fig. 217a and b), is very like that figured by Steinen as worn by the Bororó. This is drawn over the penis with the foreskin pulled forward and constricted as in the case of the Bororó also. This sheath is woven of strips of palm leaf, both by the Kanapó and the Tapirapé.[1]

Madame Snethlage of the Museu Goeldi (Museu Paraense) of Pará in 1913 published an account of an exploratory journey up a tributary of the Xingu and down another of the Tapajos. In the course of this trip she met many Indian men wearing the penis sheath. Her photographs show men of two tribes thus attired. Nowhere in her (Portuguese) text do I find any specific references to the plates, hence I have been unable to have any translations made of any descriptions of these objects. The objects themselves, shown in the half tones of groups of men, are so small and so poorly represented that it is impossible to reproduce them here.

What the connection may be between the constrictive ligature and the sheath worn by the tribes in these two river basins seemingly as a matter of tribal custom or as clothing, and the same devices worn throughout the rest of Amazonas as a protection against the candirú, is not wholly clear. The candirú is known and feared on both the Araguana and the Xingu but none of the explorers mentioned in this article speak of the use of these devices as protection against its attacks.

Now since tying the penis or wearing a sheath is a widespread custom among primitive peoples the world over, then why is it not widespread among the aborigines of South America? So, acting on the statement of Steinen (1897, p. 359) that "the sheath was formerly widely used throughout Brasil," I made a search with the following interesting results. Nordenskiold (1924) briefly in his text refers to this matter, but, what is more to our purpose here, tabulates the data known to him as follows, giving references to the authorities: 26 South American tribes are known to use a penis cover, 12 to tie this organ up to a waist band, 9 to constrict the prepuce with a thread or string, 19 to use a "lap" (the "apron" presently to be referred to by Bancroft). Nordenskiold's map shows these methods to be widely and fairly uniformly diffused over the whole of South America north of the tropic of Capricorn, but the symbols showing where the various practices are found are especially thick in Amazonas and the Guianas.

What the connection is in the use of these devices and the use of those against the candirú is not clear, but there seemingly is such. It may be conjectured that those aborigines living along the navigable waterways, and who have come in contact

[1] These proper names designate certain tribes living in the valleys of the Zingu and Araguana.

with the whites, have been lead to leave off these devices which certainly are uncomfortable, and to put on the white man's clothing. However, many of them have, to the present time when going in the rivers, continued to wear the ligature or the pudendal covering as a protection against the candirús, and, in the case of the sheath, possibly against the piranhas also. However, this is a conjecture only, the matter is one for the ethnologists.

My attention has been called to Blanchard (1904) who in a short note refers to the candirú (in which he alleges disbelief) and to the use throughout Amazonas of the protective device on the penis when in the river. Then he adds:

> A similar belief and a similar practice occur in South Africa, where haematuria due to *Bilbarzia* is found. It is acknowledged that this disease is caused by a parasite which lives in the water and penetrates the urethra of bathers. These natives too have the custom of covering the glans or binding the penis when they enter the water.
>
> We figure here the protective covering used by the Zulus of Rhodesia. This interesting object, very easy to weave, has recently been brought from Buluwayo.

Figure 17 herein is a reproduction of this curious and interesting object. The American Museum has in its ethnological collections a number of these devices from Barotseland (two lie before me as I write) agreeing closely in their general makeup with that figured and undoubtedly used for the same purpose. It is unfortunate that in none of the large number of books of exploration on the Amazon that I have read, is any such object figured. Furthermore, application to the authorities of the Museu Nacional, Rio de Janeiro, for a photograph of this device, has failed to bring any information.

Finally, it is interesting here to note that, in these two far distant and absolutely unrelated regions, we have an excellent illustration of the saying of Alexander von Humboldt that different peoples in distant countries under stress of similar necessities devise similar apparatuses or processes to attain similar ends.

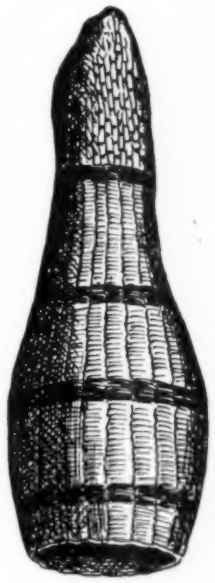


Fig. 17. Protective device against penetration by parasitic trematode (*Bilbarzia*) worn by Zulus of Rhodesia. (After Blanchard, 1904.)

ACCOUNTS OF PENETRATION BY THE CANDIRÚ WITH METHODS OF RELIEF

Over and above the data already set forth, valuable as they are, the great desiderata for establishing the fact of the penetration of the human urethra by the candirú are eyewitness accounts by scientifically trained men and especially by medical men. From the mass of data set forth previously, these men and their statements will now be abstracted.

Martius (1831) says that through "Dr. Lacerda [in Pará] we as eyewitnesses were made cognizant of the truth of the matter." The German has been translated literally but is not clear. The point has been discussed elsewhere, but it is certain that Lacerda believed in the phenomenon and had presumably seen a case. Whether Spix and Martius were actual or figurative eyewitnesses it would seem that they gave full credence to Lacerda's account.

On the issue in question Poeppig of Leipzig University says that Spix and Martius were "very skeptical until the

well-known naturalist and physician of Pará, Dr. Lacerda, had explained its foundation in truth." Poeppig then adds, and his direct testimony cannot be disregarded:

> In Yurimaguas, I myself have been an eyewitness of such a case. An Indian woman, after the penetration by a *Canero* into the vagina suffered such frightful pain and loss of blood that she was given up to die. However, after inward and outward application of [the juice of the plant called] *Xagua*, the little fish was gotten out and the woman came through alive.

We now come to Boulenger's contribution (1898a). He had his fishes and account from Dr. Bach on the Rio Jurua (upper Amazonas). Bach had not performed the amputation of the penis, which by the testimony of nearly all writers is the only thing to be done, but he had examined an Indian man and three boys, who had been so operated on. It must be noted just here that he sent to Boulenger a photograph made by himself showing the protective device in place. From this it must be concluded that Dr. Bach believed in the penetration and the resulting operation.

However, another explanation of this matter of amputation is not only possible but also probable, and in fairness digression must be made here in order to set this forth. Reference has been made to the fact that in the same waters with the candirús there are found those active, voracious and dangerous characin fishes, the piranhas and perais. As to the habits of certain of these fishes which he calls peri [perai?] let us hear that accurate observer, Edward Bancroft (1769):

> It is extremely voracious, and bites everything which hangs in the water. The feet of ducks swimming in the creeks are frequently amputated; as have been the breasts of women and the privities of men swimming in the rivers; for this reason the White Inhabitants never bathe themselves in the upper parts of these rivers without tying a napkin or handkerchief about the waist.

In this account we have two matters which plainly tie up with Dr. Bach's account as given by Boulenger; first the amputation of the penis and second the covering of the pudenda with "a napkin or handkerchief" on going into the waters of Guiana. In the rivers of this region candirús have not been found so far as can be ascertained by a diligent search through the literature. Furthermore I am corroborated in this by Mr. John Tee-Van, to whose work in British Guiana reference has already been made. He has worked on the fishes of that region, and is thoroughly conversant with the literature of Guiana fishes. In this matter he has made inquiry of the Surgeon General of British Guiana, who writes that in the medical records of the colony there is no account of the candirú.

However, the books abound in accounts of mutilations by piranhas and similar stories have been communicated to me in letters from men who have explored in tropical South America, and in all these there is no lack of recitals of amputations of fingers and toes by these voracious fishes. Furthermore, Mr. Breder has personally related to me that while in Panama on the collecting trip previously referred to little characins would collect around the men hauling the seine and would nibble at their fingers, their breasts, warts, moles, or any slight projections of the skin. They were too small to do any particular damage, only occasionally drawing blood, but they showed the characteristic traits of these carnivorous fishes. These small characins were perfectly fearless in attacking men in the water but were very wary when an effort was made to enclose them in a net.

Dr. A. Hamilton Rice of New York City, an Amazonian explorer of long experience and wide knowledge, has kindly communicated to me incidents of the voracious habits of the piranhas of which he has personal knowledge. Omitting the scores of heresay accounts for which he could not personally vouch, he states

that: "I have seen most deplorable results of mutilation by the piranha, and my own men have from time to time suffered from attacks of these fish." Of the fish itself he writes: "The piranha is a voracious blood-thirsty fish of a foot to 20 inches in length, not unlike a tautog in conformation, and with jaws similar to a circular saw in power and sharpness." He notes that it is so fierce and fearless that it will leap nearly a foot out of the water to attack a man. Omitting all accounts of mutilations by it other than that of the penis, he states that he knew of a man whose organ was thus amputated and who died of the resulting hemorrhage. Of another case we will quote his own words:

> In May, 1920, at the Portuguese Beneficente Hospital in Manaos, I saw a boy of ten or eleven years of age whose entire penis had been snipped off. He had been in bathing in a river at a spot where the water reached only to his knees. A piranha jumped suddenly, siezed his penis, amputating it at the base.

Along the same line Dr. Alfredo da Matta of Manaos kindly writes me that among other cases of accidents by piranhas treated by him was that of a boy who had part of the corpus cavernosus of the penis torn away by one of these fierce fishes.

With this possible explanation of the matter of amputation, we will now return to the question of penetration by the fish, in order to present the remainder of the evidence. In the discussion which followed Boulenger's presentation of Dr. Bach's data, the point was evidently raised as to whether the fish was small enough and the human urethra large enough for such penetration to be possible. This query was met by Boulenger (1898b) in the following note read at the next meeting of the society:

> In order that I might satisfy myself as to the possibility of the small fish, *Vandellia cirrhosa*, penetrating into the human urethra, Prof. C. Stewart kindly took me to St. Thomas's Hospital . . . when I was able to introduce without difficulty a No. 12 catheter, 5½ mm. in diameter, into the urethra of a male subject lying for post-mortem examination. The calibre of the fish being only 3 to 4 mm. no doubt can be raised as to its ability to enter the orifice of the urethra in the manner that has been described by various travellers in Brazil.

In this connection it is of interest to examine Cuvier and Valenciennes' figure of their fish which they state was "deux pouces neuf lignes" (2.75 in.) long. An outline drawing of their figure is shown herein in *natural size* (Fig. 4). Eigenmann examined two specimens of *V. cirrhosa* measuring 94 mm. (3.75 in.) and 40 mm. (1.6 in.) respectively. The smaller of these could certainly penetrate the human urethra.

Jobert (1898) thus quotes Dr. Castro of Pará, whom he describes as "a physician of high standing and a man much interested in natural history," as saying:

> I firmly believe in the possibility of such an accident because I have myself extracted from the urethra of a negress a little candirú which had penetrated during micturation while bathing in the river. The patient experienced cruel suffering for, since I had to drag the animal out, the mucous membrane was lacerated and the extraction was difficult.

Another eyewitness is Le Cointe (1922), who after discussing the danger of the penetration of the urethra by the fish says: "I have personally known already three cases of this curious accident."

Le Cointe's book is based on first hand knowledge of the natural history of Amazonas. Furthermore when I was beginning in 1925 to put into definite shape the data for this article, the well-known entomologist, Dr. Joseph Bequaert of the Harvard School of Tropical Medicine returned from an expedition to the Amazon basin. I asked him if he knew anything of the candirú, and he referred me to Le Cointe's book. He said that Le Cointe had had thirty-five years' experience in the study of the fauna of the Amazon valley, and that full credence could be given to his book. He further suggested

that I write Le Cointe for details of his experience with the candirú. This I have done, and have permission to quote from his letter as follows:

During my very long sojourn in Amazonia (since 1891) I have been able to satisfy myself that . . . the candirú is really able to penetrate into the anal or vaginal cavities of men or women bathers. Its introduction into the vagina is the most frequent phenomenon, appearing moreover to be always provoked by the imprudence of the victim in urinating in the water where she is bathing.

At the time of occurrence of one of the three accidents of this kind of which I have had full cognizance, it was incumbent on me to become a party in the matter. The thing happened on the upper Beni (in Bolivia). An Indian woman, belonging to a party engaged in the exploitation of rubber which I was directing at that time (1891), took her bath in the river and feeling herself wounded tried to extract with her hand the candirú which had already penetrated almost entirely into the vaginal cavity and which spreading out its fins [gill-covers] armed with pointed spines resisted all her efforts, wounding her profoundly. Then they brought to me this woman who was bleeding profusely. Quickly recognizing what the trouble was it was necessary for me to push the candirú forward in order to disengage the spines driven into the flesh, then to turn it in order to bring the head to the front. It goes without saying that such an operation, performed without appropriate instruments, provoked a violent hemorrhage. The Indian woman suffered greatly but she had the good fortune to recover completely in a month.[1]

A letter sent last year (1929) asking Le Cointe if any further data on the fish had come to his attention brought the word that there had not. However he passed my inquiry on to Dr. Americo Campos, a practicing physician in Pará and a professor in the medical school there. Dr. Campos, who had lived for a long time in Abydos on the lower Amazon, writes as follows:

I have made no personal observations on the subject of accidents caused by the "Candirú." A lady whom I knew at Obidos, Dona J. S., told me that a candirú entered her vagina and that it was necessary to call in a doctor to get it out. At Obidos, Santarem, and Alenquer I have heard various instances spoken of where the candirú has penetrated the ear, the nose, the anus. It is a fact that this supposition and this fear are common in the localities cited above.

Professor Starks has communicated to me the further testimony of Dr. Ammerman (the U. S. naval surgeon quoted on p. 445) on this matter of penetration. I have been unable to get in touch with Dr. Ammerman, and so have here to quote from Professor Starks' letter.

Dr. Ammerman said that he had spent considerable time in 1910–11 on the Madeira River. I asked about the candirú and he answered that he had operated for it two or three times . . . In one instance he tried to pull a fish out of a patient's penis but the tail pulled off and he had to operate, making a supra-pubic opening into the bladder to remove the fish which had penetrated into that organ.

Finally I am privileged to quote from Dr. Alfredo da Matta of Manaos, who has been referred to previously. He writes that the candirús are well known in his region, living along inhabited shores, in clear ("white water") streams (*i.e.* the Amazon, etc.), but are found less abundantly in "dark or clouded water" ("black water" streams), the Rio Negro and others. They are greatly attracted by blood. "For this reason they attack women who are menstruating, during the catamenial period, when they are washing their clothes." He then gives me the following account of a case in his own practice:

Two cases of accidents due to candirús are as follows. The first concerns a girl who, while

[1] It may not be out of place here to add two other methods of treatment for the candirú. Marcoy (1869) says that the 'native' Ucayali doctors know of but one remedy, which consists of a *tisane* made with the *genipa* or *huitach* apple, and which taken very hot acts, they pretend, on the urinary passages and dissolves the animal which obstructs them. And as to treatment Steinen (1884) simply says that "If a hot bath does not bring the disturber out, then the only thing left is an operation," i.e. amputation in the case of a male.

menstruating, went naked to bathe herself in the Cambixe, Rio Solimòes. The girls were in the habit of staying quietly in rather shallow water, only their heads out of water, and thus bathing themselves. This is what she was doing. The candirú introduced itself part way into the vagina, causing a hemorrhage when it was pulled out, and a subsequent severe inflammation. This operation requires some caution and skill because if, in order to withdraw it, the candirú is caught by its tail or by its body it expands its dorsal and ventral spines into the tissues, which fix it there more firmly than ever. The girl had to stay in bed some days.

The other case was told me. It was that a candirú had introduced its cephalic parts into the urinary meatus of a fisherman who, naked, was working in the water in the Rio Solimões, at Boa Vista. This was pulled out without difficulty or danger. Other accidents are told of, but I do not have entire confidence in them.

Here then is the evidence of actual experience by a modernly trained, scientificially minded physician, whose word cannot be doubted. However, before "summing up," as a lawyer does his case, it will be of interest to note in what relative numbers men and women have been recorded as attacked by the candirú. Most of the accounts do not distinguish sexes, but a few do. Bach's report through Boulenger (1898) was that on the upper Jurua he had seen one man and three boys with amputated penes, but the absolute reason and method of amputation is not specified, and it is at least conjectural that this may have been done by piranhas. For attacks on women we have better evidence. Poeppig (1836) personally witnessed such an accident. Castro told Jobert of numerous cases (probably hearsay accounts) in the Amazon basin, but personally operated on one woman. Le Cointe says that both men and women are attacked, the latter more frequently, and in his letter describes his operation on a woman.

So much for the published accounts. The data now to be given has come in personal letters to the present writer and is quoted by permission of the writers. Dr. da Matta has just been quoted for both sexes, but indicates that women are most subject to such attacks.

Professor Allen of the University of Kentucky writes that: "The Peruvians have a larger fish, which they say attacks women. I found the Peruvian men rarely entering the river, the women never. This was more due to fear of the *carnero* (candirú) than the paña—*piranba* of Brazil." This account is corroborated by Mr. W. K. Pearson of Indiana University who writes of the Rio Beni (one of the headwaters of the Amazon) that: "None of these [candirú] stories related to attacks on males. The female is apparently the only one attacked in this region. It is certain that anything but the very young of the *Urinophilus erythrurus* would be too large to enter the urethra of a man." On p. 178 Mr. Pearson is quoted for a hearsay but very vivid account of such a penetration in the case of a woman.

The preponderance of accounts of the penetration by the candirú in women over men has of course its explanation based on the comparative anatomy of the genitourinary organs in the two sexes. In men the orifice is open at micturation, and then very narrowly. In women in bathing or sitting in the water washing clothes the vulva is apt to be open and the vagina being a much larger orifice than the urethra, penetration of this is comparatively easy.

In this connection the observations of Breder on the small characins of the Rio Chucunaque, Panama, cast an interesting sidelight on the phenomenon in question. Account has already been given elsewhere of the fearlessness of these little fishes and of their ferocious attacks on moles, warts, nipples, calluses, and tufts of hairs of persons in the water. The Indians defecate in the streams, wading out into water up to their waists, or squatting down until the water reaches the waist line. Around such persons the little fishes collect in swarms, making

tiny attacks on every projecting part of the body. The genitalia of the women are particularly attacked and it would seem that this would be unbearable but the stolid Indian women seem to pay no attention to it. Let the places of the characins be taken by the equally small and carnivorous but also secretive and urinophilous candirús and the seeking of a hiding place in the vagina would easily follow.

In working up this data, it has forcibly struck me that no cases of penetration of the rectum are on record. One would think that the candirú in seeking a recess to creep into would not overlook such an orifice as this even though more or less closed. This matter may, it is true, negatively indicate urinotropism. Most of the writers quoted speak of penetration of the secret openings of the body, speaking almost invariably in the plural. However, Schomburgk speaks specifically of alleged penetration of the rectum, and Le Cointe says that it penetrates the anal opening, as does Dr. Campos also.

Again there are no records known to me of the candirú's having penetrated the urinary passages of such large fishes as the Piraruçu and the huge catfishes of the Amazon, or the urethra and bladder of alligators and turtles among reptiles, of the dolphin and the manatee among water mammals, and of the terrestrial tapir and domestic cattle and horses when bathing in the river. However, in explanation it may be said that we have no accounts of such dissections of these animals as would reveal the presence of the candirú. There is certainly an opportunity here for interesting research.

From the data set forth and carefully analyzed in the preceding pages, the reader must make up his own mind as to the credibility of the widespread belief in the Amazon basin of the penetration of the human urethra by the candirú, a slender catfish of those waters, of secretive habits, having patches of hooks on the gill-covers and the back of the head, a suctorial mouth on the under side beset with rasping teeth, having much restricted branchial openings and a short straight stomach and intestine: all these things fitting it for holding fast, rasping the skin, and sucking the blood of its host. On the bare face of the matter it seems absolutely incredible, but so does many another matter, either in ichthyology or medicine, to which our minds are not accustomed. As Prof. W. K. Brooks of the Johns Hopkins University used to say to his students: "It is not safe to say that a thing, no matter how improbable it may seem to you, does not exist because you have never seen it."

There is herein set forth a great mass of testimony bearing on the phenomenon from 1829 to 1929, and the very mass of this testimony backed by the names of the testifiers is impressive. In 1831 Dr. Lacerda, a physician of high standing in Pará, a friend of Spix and Martius, made it as clear to them as if they "were eyewitnesses." The positive eyewitness testimony of Professor Poeppig of Leipzig University is prime evidence. Dr. Bach was evidently sincere in his testimony, which seemingly convinced Boulenger. Jobert testifies to the high standing in Pará of Dr. Castro, who asserts that he operated on a case of penetration. Next we have Le Cointe, who says that he has known personally three cases of penetration and who describes one operation which he performed. Dr. Ammerman testifies that he operated for candirús two or three times, once extracting the fish from the patient's bladder. There are the accounts mentioned by Dr. Campos of the medical school at Pará, to which he evidently gave some credence since he was kind enough to transmit them. And finally there is the testimony of Dr. da Matta of Manoas of a case in his own practice.

It seems to me that this evidence is sufficient to convince a jury in a court of law, and I cannot withold my belief in it.

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BOOK REVIEWS

THE PHYSICIAN THROUGHOUT THE AGES. By Arthur Selwyn-Brown. N. Y., Capehart Brown Co., 1928.

For the publication of these two massive volumes little excuse is to be found. The foreword is preceded by a picture of the Editor and followed by James Whitcomb Riley's poem "The Doctor." Chapter I is headed "Primitive Medicine and the Medical Man; Antiquity and Universality of Disease; Paleopathology Supplies Interesting Evidence" and from there on scissors and paste are used to fill two volumes of over 800 pages each, 12 by 9 inches, double column. Articles are duly credited to their authors but not always to the place of original publication. It is not quite clear for whom this work is intended. Many of the pages read like the daily tabloids, others are fairly scientific. If the idea was to present a complete history of medicine, either popular or scientific, then it may be said that this has been much better done in many other volumes. Taking the books at random we find Chap. XVI in Volume I on "Rise of the Medical Libraries, Foundation of Scientific Biology" and we see a black-face headline reading "Alexandrine Libraries Exert Vast Influence," followed by this illuminating paragraph: "The libraries played a great part in diffusing medical and scientific knowledge, and none appears to have exerted more influence than the great library at Alexandria." Other headlines read "Aristotle Skilled in Dissection" and "Aristotle, the First Scientific Biologist." Opening Volume II at random we come to Chapter XLI headed "Death and its Significance, Immortality Revealed by Anesthesia," a headline that must be the envy of the editor of every sensational newspaper. We also find such headings as "Fear of Death is Baseless" and are suddenly confronted with a portrait with the caption "Julius Wagner-Jauregg, M.D., Noble Prize Man (*sic!*) in Medicine, 1927." Another heading reads "Fatalism, Irony, and Charity" and right after this we find "The Biology of Death" by Raymond Pearl, M.D. A book of surprises if there ever was one! Book IX has the title "The Doctor as an Adventurer in Literature and the Arts: A Galaxy of Able Writers" and here is reprinted "Man's Redemption of Man: An Inspiring Essay, by William Osler, M.D." No reference to previous publication or permission to republish is made. It would have seemed good taste to mention its earlier publication and not to create any possible impression of its being written for this work which was published nine years after Sir William's death. In the following pages are such headlines as "True Until Death," "Professor Coue Anticipated," "Were the Mules Responsible?," "A Mental Teaser." There is much more that is amusing and even irritating in these volumes.

There is also a little wheat among great quantities of chaff. The bibliography on page 812 contains the following paragraph: "This bibliography has been compiled to guide students to sources for augmented reading. Most of the books cited contain bibliographical references which will lead to further and ultimate sources whenever more exhaustive studies are required. Unfortunately, medical history has been a neglected study and its source materials are rare and are confined to a few of the larger European libraries." This statement will probably be a surprise to those who have access to such libraries as the Surgeon General's, those of the New York Academy of Medicine, the College of Physicians in Philadelphia, the John Crerar Library in Chicago, the Boston Medical Library, to say nothing of the new William Welch Library, in Baltimore. Perhaps, however, the statement is not so surprising when it is noted that one looks in vain for the names of such modern historians as Sudhoff and Garrison, to say nothing of many others. We find the index headed "Index and Chronology of Distinguished Physicians and World-Known Authorities." This is followed by the "Index of Subjects" in which we find such citations as "Arabs Were Mentally Keen," "Bible Story Illustrated, A," "Libido, The Ego Displaces the," "Numerology Still Used in Medical Practice" (turning to this reference we find it discusses the use of numerology by the Arabs). As said before, the work has its amusing as well as irritating side and not the least of these is its price—$25.00.

SUPPLEMENT TO

The American Journal of Surgery

A CLINICAL STUDY OF THE ABDOMINAL CAVITY AND PERITONEUM

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A CLINICAL STUDY OF THE ABDOMINAL CAVITY AND PERITONEUM

SECTION 1. THE CAVITY (*Continued*)*

B. THE FLOOR, OR PELVIS

The Anatomical vs. the Functional Abdominal Floor

THE abdominal cavity, strictly speaking, has no floor for its lowest limit is simply an arbitrary anatomical boundary, the pelvic inlet or brim of the true pelvis (see Fig. 13). The interest of the surgeon is in the functional floor of the abdomen. This consists of the pelvic bones, the pelvic viscera, and that muscular sling known as the pelvic diaphragm (see Fig. 14). The contraction of this pelvic diaphragm (two pairs of thin muscles, the levatores ani and coccygei) as that of the true diaphragm, plays an important rôle in producing changes in intra-abdominal pressures and the pelvic floor supports abdominal as well as pelvic organs (see Fig. 15). The abdomen proper, then, ends as an opening or space, bounded anteriorly by the symphysis pubis and pubic crests, posteriorly by the sacral promontory and laterally by the iliopectineal lines; and the word pelvis (L. a basin), when used without qualification refers to the pelvis minor, i.e. that portion of the body cavity situated below the plane of the inlet.

The Abdominal Surgeon and the Pelvic Diaphragm

There are many reasons why the pelvic floor is of special interest to the abdominal surgeon. Its orifices provide avenues through which he may examine, digitally and instrumentally, the lowest regions reached by peritoneum (rectal, vaginal, sigmoidoscopic and cystoscopic examinations): discharges

* With the January, 1930 issue, p. 193 began a study of the abdominal cavity as an empty space, i.e., as simply a container for the organs upon which the abdominal surgeon must operate. The roof of the cavity, the diaphragm, was investigated and as the embryology, anatomy, and physiology of this structure were reviewed, minute consideration was given to clinical points, the interpretation of which was dependent upon peculiarities in the arrangement and function of the diaphragm.

through these orifices are important in the diagnosis of pathological conditions within the abdomen (clay-colored and frothy stools, melena, azotorrhea); reflex phenomena of

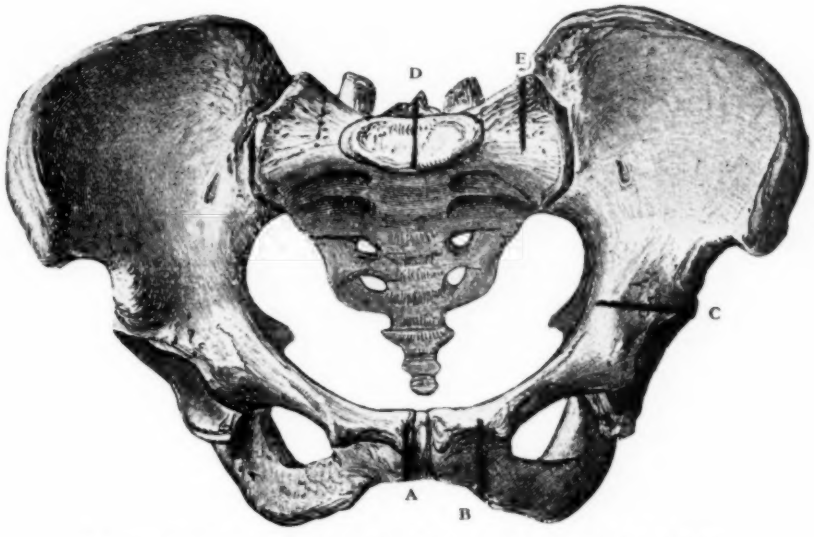


FIG. 13. Lower anatomical boundary of abdomen. Pelvic inlet.

A. Symphysis pubis. B. Pubic crest. C. Ilio-pectineal line. D. Sacral promontory. E. Ala of sacrum.

importance in abdominal differential diagnosis may be present in the region of the pelvic outlets (pruritus, spasticity; viscerosensory and visceromotor phenomena); venous congestion within the rectum (internal hemorrhoids) is often indicative of portal obstruction; infections and foreign bodies reach the abdomen through the orifices of the pelvic floor (pneumococcus and gonorrheal peritonitis; rectal foreign bodies); and the anus provides an ideal approach for the administration of fluids, food and medicines in the treatment of various intra-abdominal diseases; furthermore, the abdominal surgeon must study the anatomy and physiology of the anus and rectum to be able to create a permanent inguinal or abdominal colostomy which will perform its tasks in a manner which is adequate and satisfactory; in addition, the pelvic route may be employed for the drainage of collections of pus which have

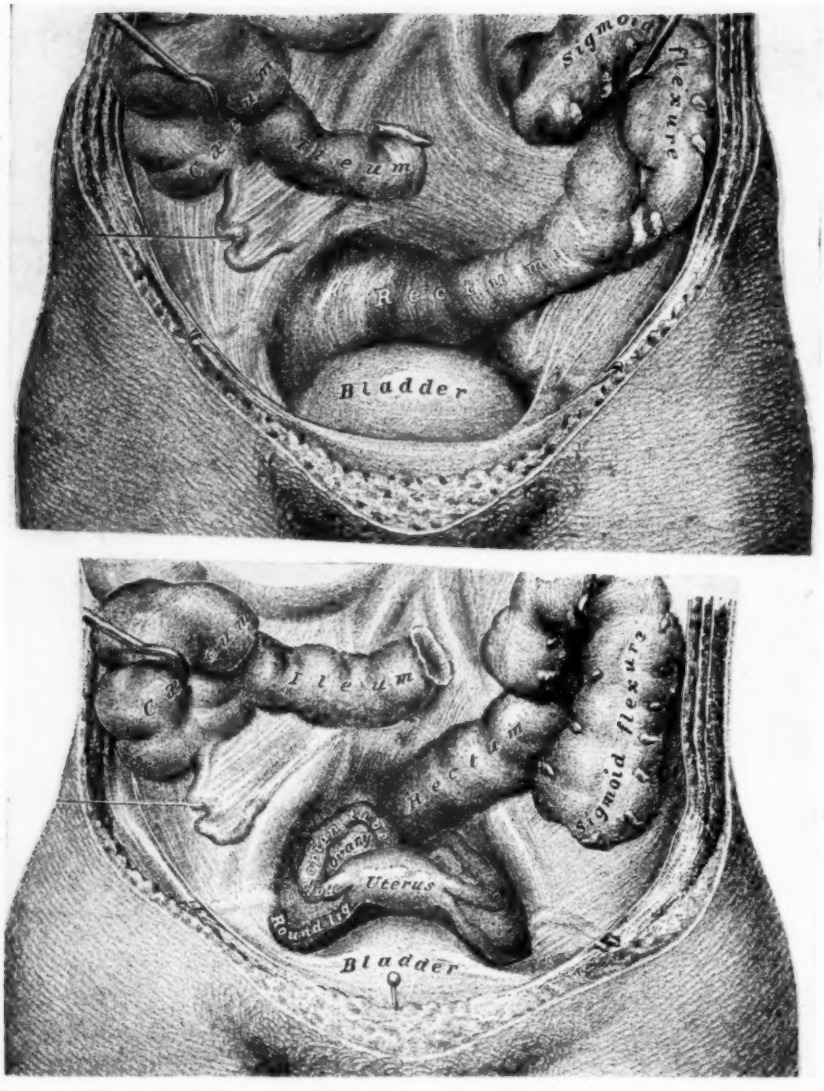


FIG. 14. Functional floor of abdominal cavity, consisting of (1) pelvic bones, (2) pelvic viscera, (3) pelvic diaphragm. Showing lowest reflections of peritoneum. (After Weisse.)

A, Male. B, Female.

gravitated from the abdomen to the lowest reflexions of peritoneum.

Pathological Processes in the Pelvic Peritoneal Pouches

The importance of the anus for diagnosis is well expressed

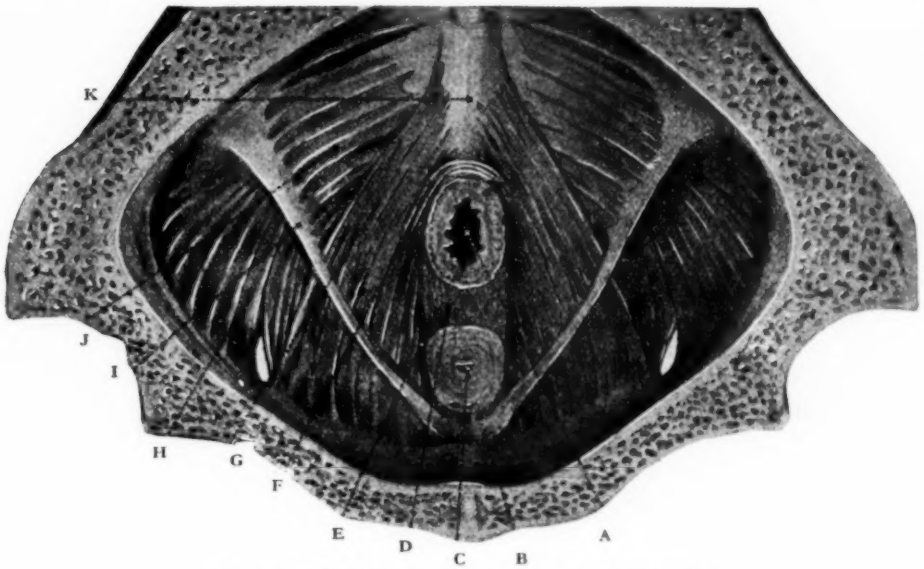


FIG. 15. Pelvic diaphragm. (After Cunningham.)

A, Rectum. B, Median pubo-prostatic ligament. C, Prostatic urethra. D, Central point of perineum. E, F, G, Parts of pubococcygens muscle. H, Obturator internus muscle. I, Arcus tendineus. J, Iliococcygens muscle. K, Anococcygeal raphe.

by the statements that "a finger within the rectum may yield more information than a thermometer within the mouth," and that "the difference between the general practitioner and the surgical consultant is this: the consultant does not neglect the rectal examination"; again, by the somewhat less elegant expression that "the diagnostician who fails to put his finger into the rectum very often puts his foot in it." By examination through the anus (L. *annus*, a ring) it is possible to detect the tenderness of acute inflammations, to locate adhesions which have fixations to the rectum, and to palpate masses located within or pressing upon the rectal walls. Within the perirectal reflexions of peritoneum (pouch of Douglas); recto-vesical and lateral or pararectal pouches) there may be discovered abnormalities such as the prolapse of abdominal

organs, or local collections of blood, pus, or malignant tissue (see Fig. 16).

Reaching the Peritoneal Pouches

Due to the elasticity of the pelvic floor the surgeon may

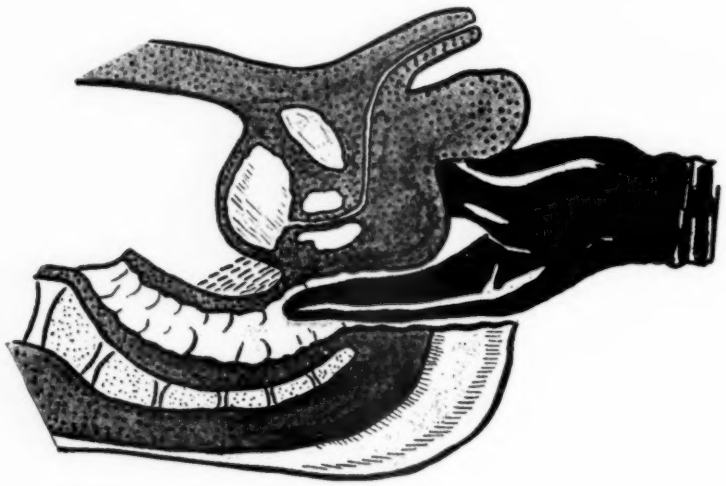


FIG. 16. Rectal examination. Palpating rectovesical pouch. In this case a collection of pus is shown in the pouch. (From Bailey.)

reach further into the rectum than the normal 3 to 4 inches representing the length of his index finger. A slow, steady upward pressure allows considerable inversion of the pelvic diaphragm and this may carry the examining digit to a point from 1 to 1½ inches higher within the canal. The normal height of the rectovesical and rectouterine pouches varies considerably. As a rule, with empty rectum and bladder, the fold of peritoneum upon the anterior rectal wall comes to 2 or 2½ inches from the anus (1 inch or 2.5 cm. above the base of the prostate);[18] i.e. opposite the level of the fifth sacral vertebra. When the rectum or bladder is distended the reflexions of peritoneum lie considerably higher and may extend well beyond the reach of the palpating finger. In a child the pelvis is shallow while the peritoneum is reflected to much lower levels than in the adult, both factors contributing to the ease with which the lower abdomen may be reached during childhood.

Technic for the Rectal Digital Examination

It is important to be both gentle and deliberate when performing a rectal examination, if most is to be gained from the procedure. The extreme distance to which the digit may be passed when the patient has been anesthetized—(whether by a general anesthetic or by spinal or caudal nerve block) illustrates the advantage in securing muscular relaxation. The patient is warned not to strain but to lie quietly, breathing with the mouth open; and is informed as to exactly when the examination is about to begin. The finger is best held firmly against the anal verge until the sphincter is felt to yield, rather than thrust forcefully into the rectum. The finger, gloved and well lubricated throughout its entire length, is introduced very slowly and with a slight rotary movement. The presence of hardened feces renders the examination unsatisfactory and if these are encountered the procedure is best deferred. The novice has at times, mistaken the uterine cervix or fundus, felt through the rectal wall, for an ulcer or a new growth. It is well, when examining the female, to identify the uterus before searching for other structures or pathological conditions. The examination should be conducted systematically, "synchronizing the mind and the finger." Local inspection of the perianal region with the aid of a good light should be the initial step in every examination. The actual palpation may be carried out as follows:[19]

In the male	Anterior wall.	1. Prostate, right lobe, left lobe.
		2. Right seminal vesical; left vesical.
		3. Rectovesical pouch.
	Left lateral wall; pararectal pouch.	
	Right lateral wall; pararectal pouch.	
	Superiorly, as far as can be reached.	
	Posteriorly; hollow of sacrum; coccyx; pyriformis muscle.	
In the female	Cervix.	
	Pouch of Douglas.	
	Left lateral wall.	
	Right lateral wall.	
	Superiorly, as far as can be reached.	
	Posteriorly; hollow of sacrum; coccyx; pyriformis muscle.	

Having completed the examination the finger is examined for blood, mucus, or pus.

Any of the following five positions may be employed: (1) the knee-chest (or knee-elbow) (see Fig. 17); (2) the left lateral position (Sim's) (or right lateral position); (3) the

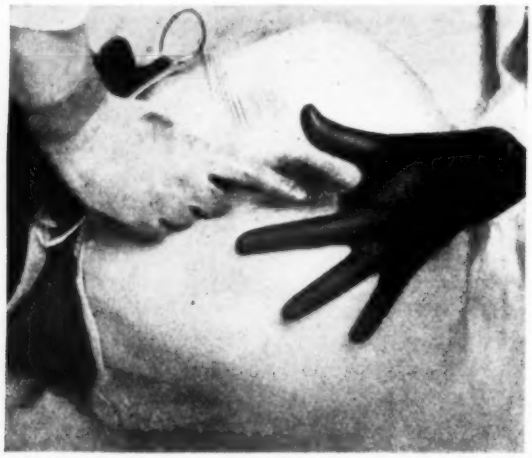


FIG. 17. Rectal examination. Knee-elbow position. (From Bailey.)

lithotomy (or exaggerated lithotomy); (4) the squatting, or (5) the dorsal decubitus. The routine position for the male is usually the knee-chest; for the female, the Sim's position; the squatting posture is reserved for instances in which a high obstruction or tumor is sought or a prolapse is being examined; the dorsal decubitus is reserved for patients who are confined to bed and are too ill to be turned upon the side, particularly those with acute peritonitis.

Transcelomic Malignant Transplants

A rectal examination is indicated in every case of suspected intra-abdominal malignancy. Tumor cells or small masses of neoplastic tissue may become detached from any subserous malignancy and may be thrown into the peritoneal cavity, there to be carried by gravitation to the pelvic peritoneum and to form metastatic growths which may be felt upon rectal digital examination (see Fig. 18).

Passing the Sigmoidoscope

The sigmoidoscope makes it possible to examine still higher levels of the gastrointestinal tract by way of the pelvic floor. In passing this instrument it is necessary to bear in mind the curves which will be encountered before the abdomen

is reached. The rectum is not, as its name might imply, a perfectly straight tube. Inspection from the anteroposterior and also from the lateral views shows that it has curvatures

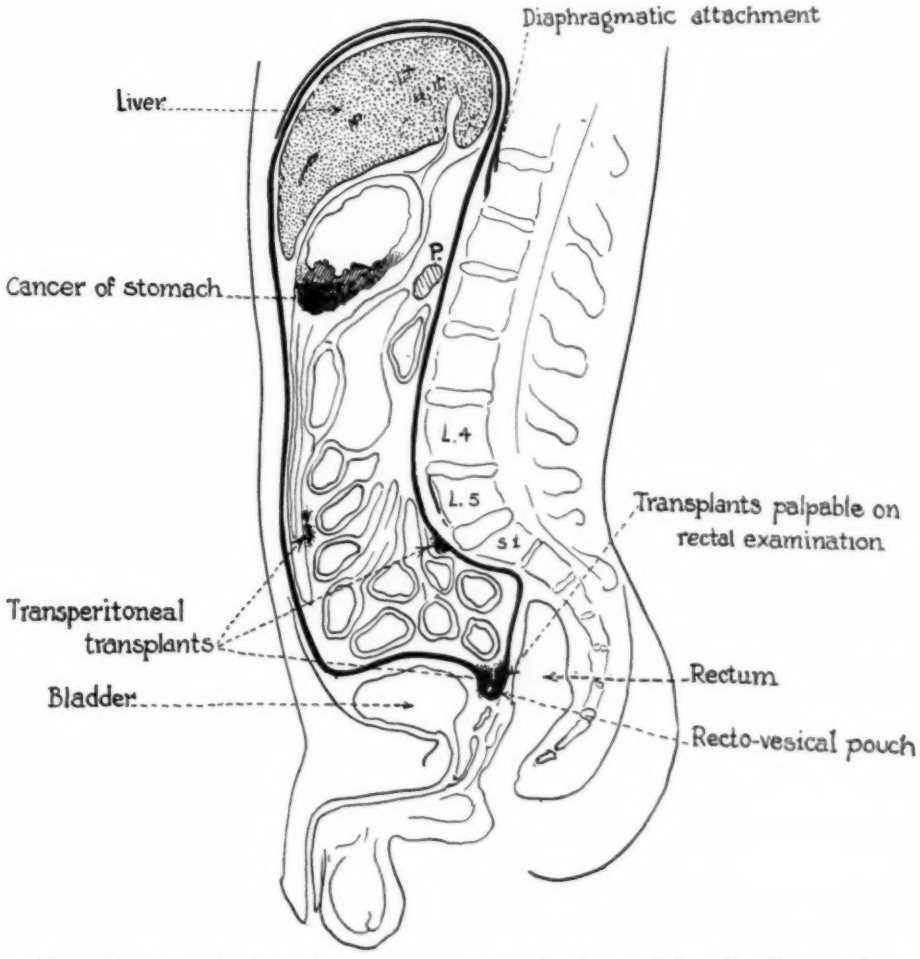
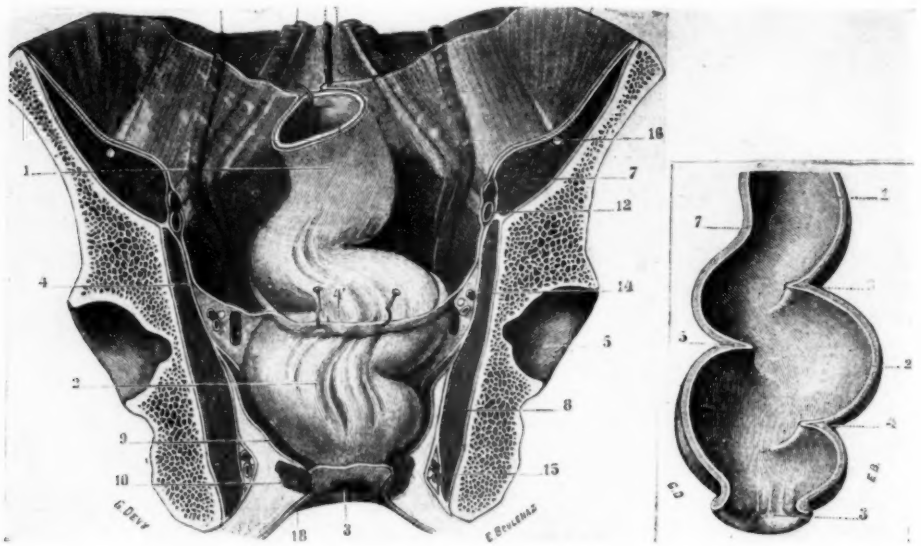


FIG. 18. Transcelomic malignant transplants, showing nodules of malignant tissue which have gravitated to the lowest portions of the peritoneal cavity and may be palpated through the rectal wall.

in both planes. The course of the terminal bowel is as follows: The pelvic colon terminates to the left of the midline; the rectum thence follows the hollow of the sacrum, while the anal canal pierces the pelvic floor in a direction which is downward and *backward*. Therefore the course of the sigmoido-

scope, which passes in the opposite direction, or from below upward, must be: first upward and *forward* through the anal canal (1½ in.), then upward and *backward* following the



A B

FIG. 19. Houston's valves.

A, Lateral curvatures in rectal walls. Note that middle curve marks approximately level of lowest reflection of the peritoneum.

B, Note sacculations caused by the plicae transversals or semilunar folds of Houston.

depths of the sacral curvature; and finally, in order to clear the sacral promontory and enter the sigmoid colon (i.e. to enter the abdomen), the instrument must be so directed as to take a path which is upward, *forward, and to the left.* To facilitate the passage of the sigmoidoscope direct vision through the visual obturator may be employed, and the rectum inflated. The female proves more troublesome than the male as a subject for sigmoidoscopic examination, due to a greater depth of the sacrum in the former. Care must be taken to avoid mistaking for pathological conditions any of the three (the usual number) crescentric shelf-like folds which project into the rectum[20] (plicae transversales recti, or semilunar valves of Houston). Of these folds the largest is situated

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upon the right side of the rectum and may serve as a rough landmark for the site of reflexion of peritoneum (2½ to 3½ in. above anus). (See Fig. 19.) The upper and lower folds are on the left side and located from 1 to 1½ in. above and below the middle fold, respectively. The upper fold marks the rectocolonic junction.

Bimanual or Pelvi-abdominal Palpation

Other instruments used for examinations through the pelvic floor are the cystoscopic and vaginal speculum. There are obvious rewards for the surgeon who acquires skill in the use of the cystoscope and in the interpretation of cystoscopic findings. It is accepted as a rule that any female with abdominal symptoms should be examined vaginally. Bimanual palpation, both recto-abdominal and vagino-abdominal, may prove of special value to the abdominal surgeon, since the external hand frequently can direct a tumor mass against the internal hand, or otherwise so increase intra-abdominal pressure as to greatly facilitate the examination.

Rectal Foreign Bodies

Not only may the surgeon introduce objects into the orifices of the pelvic floor, but so also may the patient. Rectal foreign bodies, once they have passed the internal sphincter, tend to travel upward through the descending colon and may even be carried as far as the cecum. The explanation of this fact is found in the reverse peristalsis or anastalsis observed in the large bowel. This intestinal current, which is normal in no other part of the gastrointestinal tract, serves the purpose of keeping the contents of the large bowel from too prompt evacuation and insures a more complete removal of liquid and nutrient elements, with the formation of the semisolid mass constituting the normal stool. Foreign bodies which have been carried upward may become so lodged or incarcerated that they cannot be removed by the aid of enemas, irrigations or purgatives, and hence necessitate abdominal operations for their recovery.

Alvine Discharges and Abdominal Disorders

The pelvic floor is no less interesting to the abdominal surgeon as a portal of exit than as a portal of entry. Blood, mucus and parasites discharged with the feces are indicative

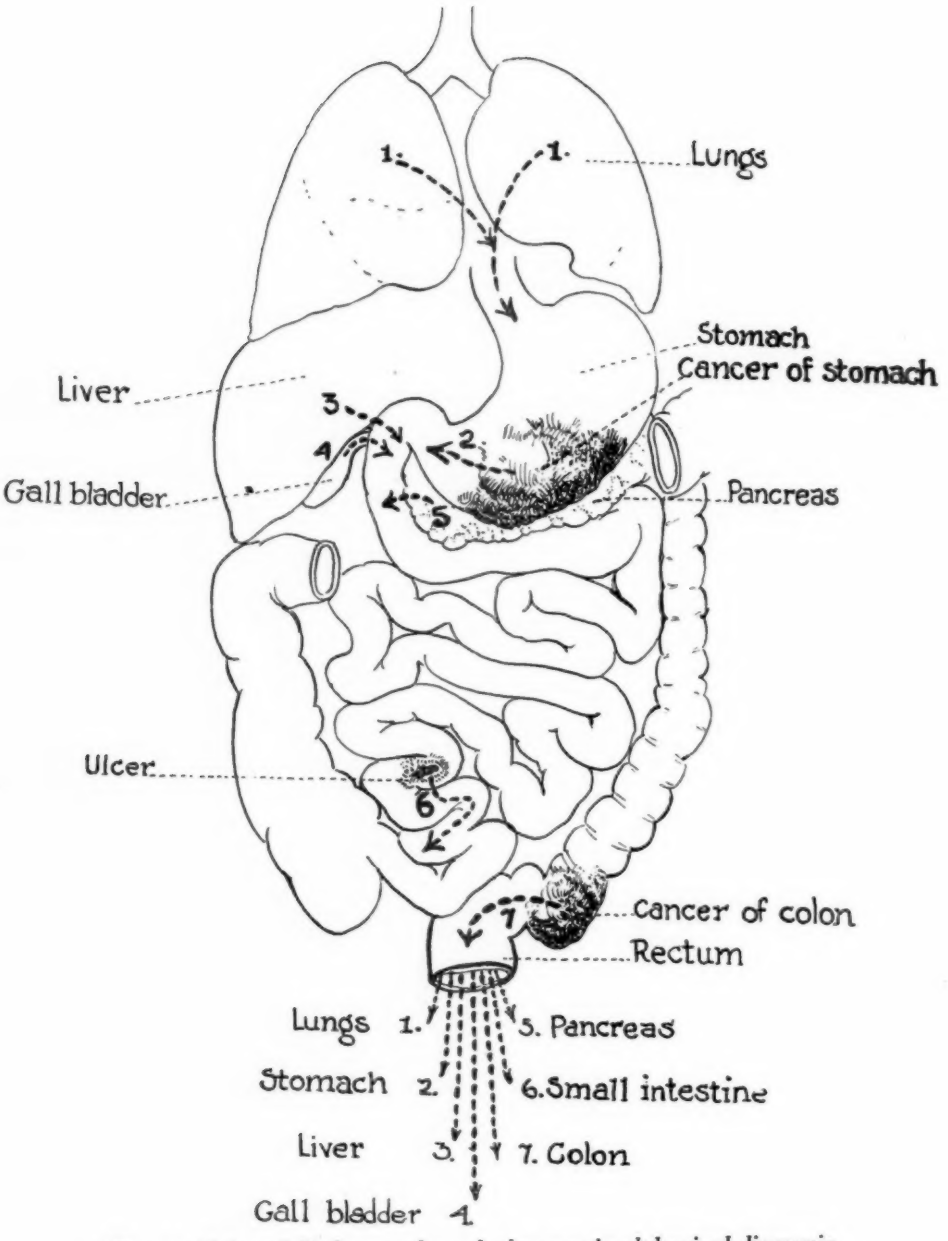

FIG. 20. Value of discharges through the anus in abdominal diagnosis.

of some ulcerative or other pathological process in the intestinal tract. Equally important, the presence of an abnormal alvine (L. *alvus*, belly) discharge may prove an unmistakable guide to some disorder of an organ which is an outgrowth of the primitive enteral canal. Thus biliary disease is indicated by the passage of gallstones or clay-colored and frothy stools, while the presence of steatorrhea (excess of fat) and azotorrhea (excess of nitrogenous materials) suggest pancreatic disfunction (see Fig. 20). Likewise the lung and upper respiratory tract retain a communication with the intestinal canal and may contribute materials to its contents which can be recovered through the anus. Tubercle bacilli swallowed with mucus from the bronchial tube may pass through the enteral tract or may set up a secondary tuberculous enteritis. Germs from an acute infection of the lymphoid tissue of the tonsils may be discharged with the intestinal content or may even initiate such a pathological change as an involvement of Peyer's patches (see Henoch's purpura) or of the lymphoid tissue of the vermiform appendix. Such direct routes of extension are secondary in importance only to the hematogenous pathway.

Pelvic Herniation of the Peritoneum

With severe degrees of prolapse or procidentia of the rectum (L. *procidere*, to fall down or forward), the peritoneal pouches of the pelvis may be actually carried outside of the pelvic floor. Thus in resecting a protruding and redundant mass, the peritoneal cavity may inadvertently be entered, an accident which makes a complicating putrefactive infection and peritonitis exceedingly likely. Again, the herniated pouch may contain prolapsed small bowel. In such a case careless operative interference may be attended by even greater damage. A complete rectal herniation, also known as an archocele (G., *archos*, fundament + *kele*, tumor,) must be treated by abdominal exposure or rectopexy (G. *pexis*, fixation) rather than by perineal excision. With all rectal prolapses beyond those of the second degree the possibility must be borne in mind that abdominal contents may constitute a part of the external mass (see Fig. 21).

The Open and the Closed Cavity

In interpreting the influence of sex upon the incidence of abdominal diseases the anatomical fact should be kept in mind that in the female there is a direct communication be-

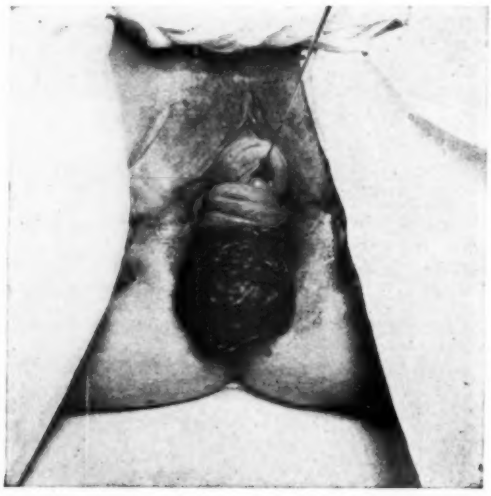

FIG. 21. Rectal prolapse with intestines herniated into pararectal pouch; associated with prolapsus uteri and rectocele from lacerated perineum. (From Keen's Surgery, W. B. Saunders Co.)

tween the peritoneal cavity and the outside of the abdomen by way of the uterus and Fallopian tubes. Normally a mucous plug at the uterine cervix, the tightly contracted cervical sphincters, and the overlapping fimbriae at the peripheral end of the tubes serve to effectively seal the female peritoneal cavity.

Further Considerations Regarding the Pelvic Floor

Additional important considerations concerning the pelvic floor appear in other chapters. During the study of the abdominal circulation the clinical significance of chronic passive congestion (see Fig. 22) thrombosis and embolism within the rectal and pelvic regions is discussed; in the section dealing with the enteral tract the value of the rectal route for the administration of medications and fluids is considered; in the review of visceral neurology the relationship between pruritus ani and intra-abdominal pathological conditions receives

attention, and the significance for the differentiation between pelvic and abdominal disorders of rigidity of the levatores ani is investigated (muscles innervated on their pelvic surface

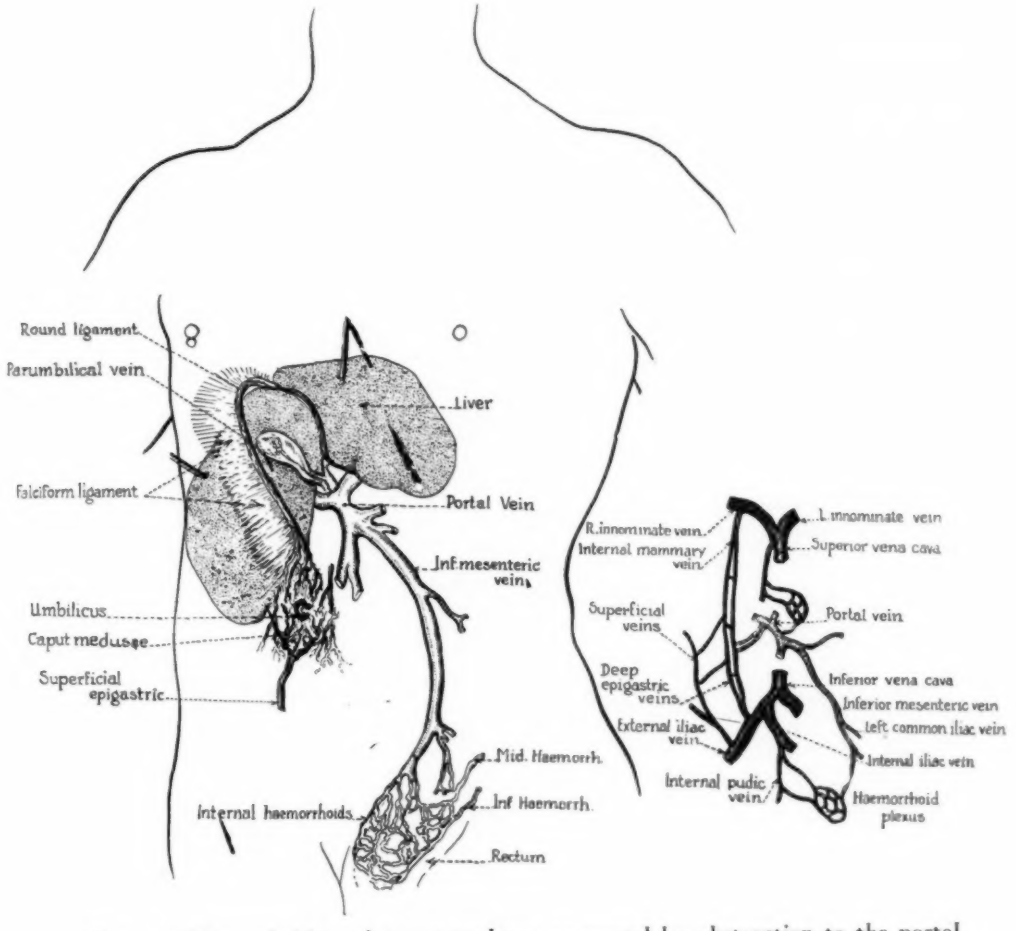

FIG. 22. Hemorrhoids and caput medusae as caused by obstruction to the portal circulation.

by the anterior rami of the third and fourth sacral nerves and on their perineal surface by the perineal branch of the pudendal nerves); in the study of peritoneal drainage, anterior colpotomy is described (see Fig. 23). In like manner, other details concerning the pelvic floor are reserved for pages which follow.

C. THE ABDOMINAL WALLS

The Thoracic Box vs. the Abdominal Bag

There exists a striking contrast as to composition between the walls of the upper and the lower divisions of the trunk.

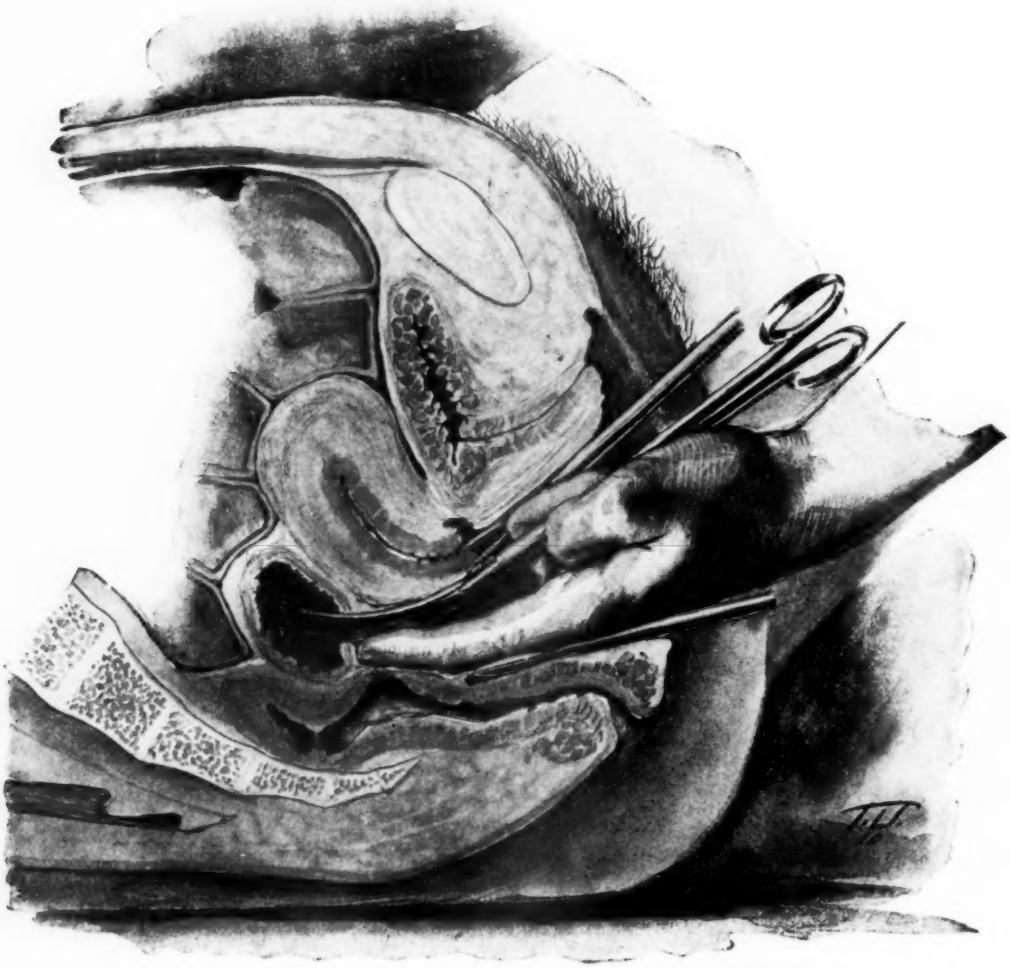

FIG. 23. Anterior colpotomy for drainage of pus which has gravitated to lowest portion of peritoneal cavity. Penetrating abscess wall. The sharp-pointed scissors, under the guidance of the finger, have been introduced into the mass and then opened widely. (From Crossen's Operative Gynecology, C. V. Mosby Co.)

Thoracic walls are composed largely of bone, while abdominal walls are made up chiefly of muscles. The walls of the thorax are rigid; those of the abdomen are soft. This distinction is

implied in the names which have been given to these respective divisions of the body. The word chest means a box (A. S. *cest*, box) and the term thorax, a plate of armor (Gr. *thorax*, a cuirasse). The word belly, on the other hand, signifies a bag (L. *bulga*, bag) or something capable of being alternately filled and emptied. The abdomen is synonymously known as the venter (L. *venter*, belly), just as a chamber of the heart, alternating with the rhythmic cardiac cycle between a contracted and a relaxed state, is termed a ventricle; and as the stomach, periodically changed in size with the intake and output of food, is known as a ventriculus (i.e., a little, or small model belly). Functional activities within the abdominal cavity, as within the thoracic cavity, depend quite largely upon peculiarities in the composition and structure of its walls.

Muscles Encountered in Entering the Peritoneal Cavity

1. *The Muscular Walls.* When speaking of "abdominal muscles" the surgeon often refers simply to the large, flat muscles of the anterior abdominal wall. This is true because patients are usually examined as they lie in the dorsal decubitus, making the anterior wall the presenting surface. This group, however (recti, transversi, external and internal obliques) far from constitutes a complete list of abdominal muscles and it fails to suggest the conception that the abdomen is a muscular bag. The muscles of the posterior wall together with those of the floor and roof, functionally speaking, are coordinated in their action with those of the anterior wall, making possible wide changes in the capacities and pressures within the venter, or belly. The quadratus lumborum, psoas major and minor, iliacus, levator ani, and coccygeus muscles are as deserving of consideration as are the diaphragm and the transverse, straight, and oblique muscles of the front and sides of the abdomen (see Fig. 25). But in addition, the surgeon must know many anatomical details concerning any and all of the muscles which he may sever when entering the abdominal cavity. Thus numerous muscles which support or move the extremities overlie portions of the abdomen, for example the latissimus dorsi and the glutei, and these must be dealt

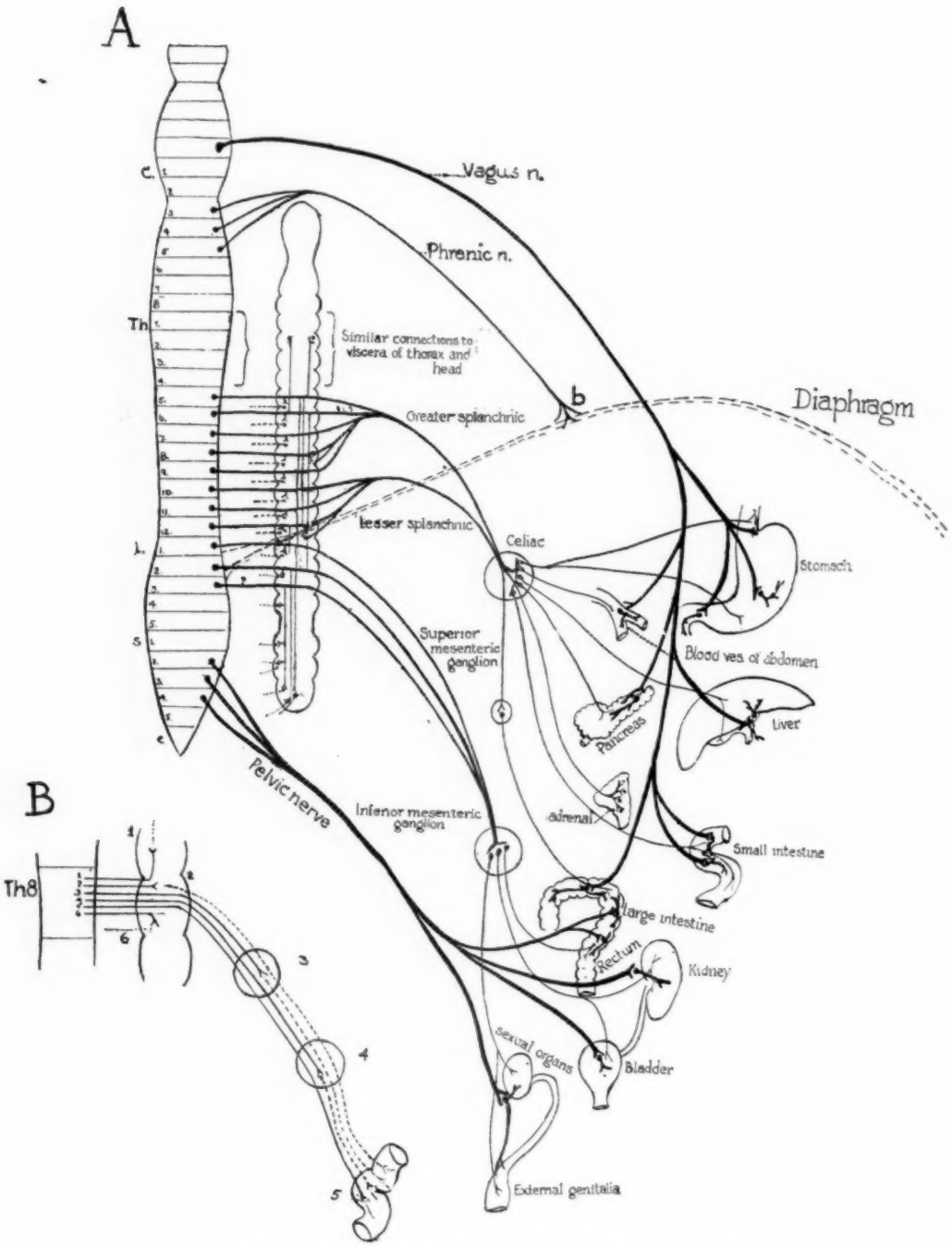

FIG. 24. Nerve pathways between abdominal viscera and spinal cord. B. White rami communicantes.

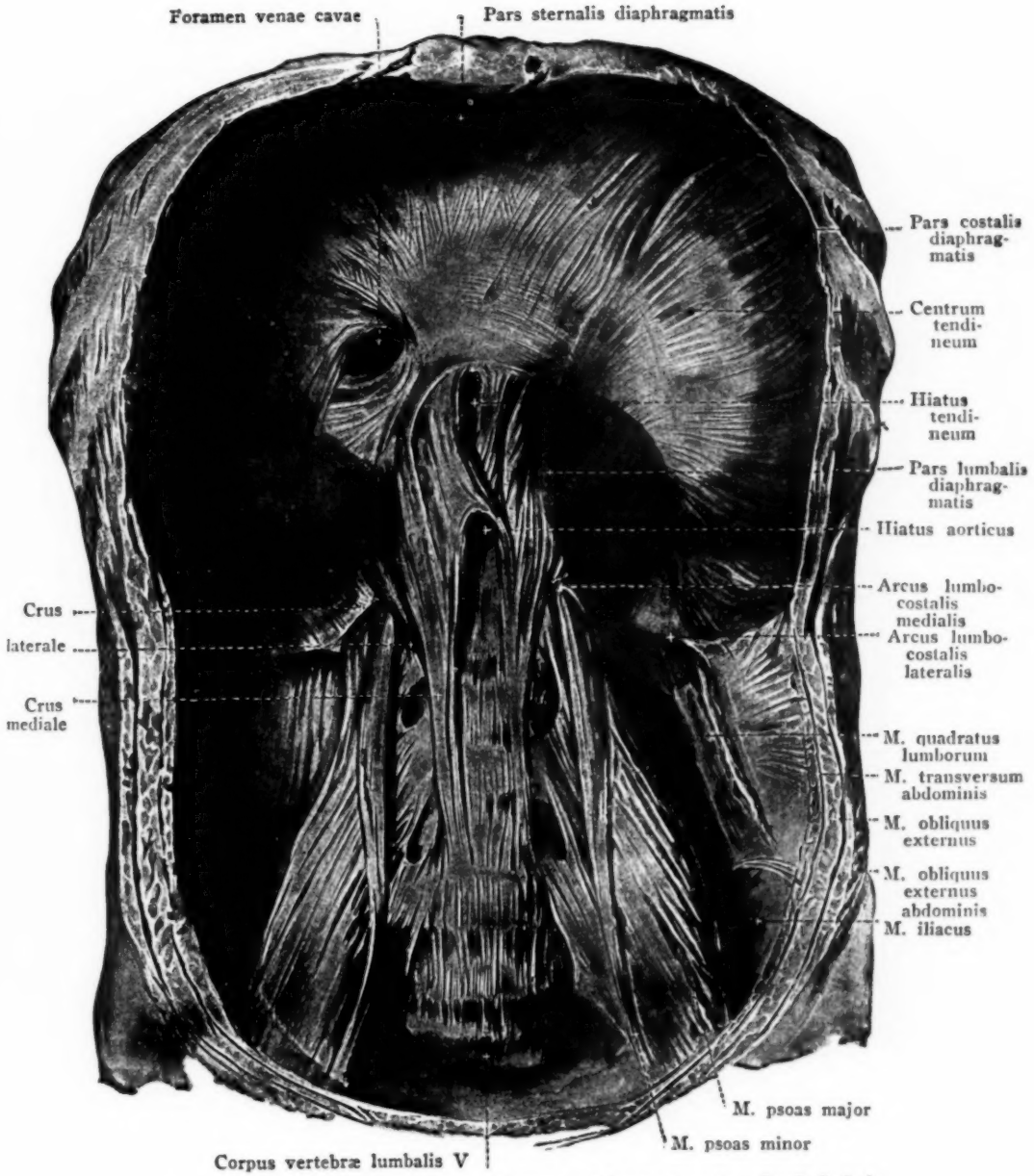

FIG. 25. Muscles of posterior and lateral abdominal walls. (Spalteholz.)

with when operations are performed in special regions, as must also the intercostals and certain other muscles of the thorax when the peritoneal cavity is approached from above.

Muscles Involved by Reflex Spasticity

When the abdominal walls are studied for a review of operative surgery, anatomical considerations are of chief importance, but when the abdominal muscles are reviewed for the purpose of gaining some clinical understanding of the reflex spasticities which may accompany disorders within abdominal organs, the major emphasis must be placed upon the innervation, central connections and function of the muscles rather than upon their positions. The reflex mechanisms by which tension variations of the contractile tissues are produced, prove complicated. Abdominal organs are connected with the spinal cord through the white rami communicantes of the sympathetic nerves[21,22] (the thoracicolumbar division of the involuntary nervous system; see Visceral Neurology) and these white rami pass to the spinal cord, exclusively between the fifth thoracic and the second (or third) lumbar cord levels (Th5-L2)[23] (see Fig. 24). Skeletal muscles which exhibit clinical evidence of reflex spasticity from diseases within intra-abdominal viscera are those having motor neurones which are situated in the anterior horns of these particular cord levels (Th5-L2).

Connecting Pathways Between Abdominal Viscera and Skeletal Muscles

That the study of gross anatomy alone is inadequate, in this connection, is shown by the fact that some of the muscles possessing such reflex associations with intra-abdominal structures are situated at a considerable distance from the abdominal cavity itself (examples: rigidity of the muscles innervated through the third and fourth cervical segments, due to irritation of the central portion of the diaphragm, the afferent stimuli traveling by way of the phrenic nerves; spasm of the cremaster muscle with ureteral colic, the reflex being produced through afferent stimuli passing over the white rami communicantes to reach motor neurones of the first lumbar level of the spinal cord). On the other hand, some of the muscles which overlie the abdomen, and thus anatomically form part of its covering walls, possess no such reflex associations with abdomi-

nal viscera. For example, the latissimus dorsi overlies the abdominal cavity posteriorly, arising from as far downward as the crest of the ilium. But this muscle, being innervated exclusively by cervical nerves (C6-C8), has no direct nerve pathways which connect it with the organs of the abdomen. Similarly, the glutei muscles, maximus, medius and minimus, lie in part above the level of the pelvic inlet (hence overlie the lower part of the abdominal cavity), but since these muscles are innervated solely through levels between the fourth lumbar and the second sacral segments of the cord (L4-S2), they could have no direct reflex connection with abdominal organs by way of the white rami communicantes. All muscles with the function of moving any part of the upper extremity derive their motor neurones from the fifth cervical to the second thoracic cord levels (C5-Th2) and the muscles related in an analogous fashion to the thigh, leg, and foot are innervated from the second lumbar to the third sacral cord level (L2-S3). Almost all of these muscles, then, possess no direct reflex pathways associating them with abdominal organs and for the present study of the muscular walls of the abdomen the cavity will be considered simply as a part of the ovoid mass which constitutes the trunk (see Fig. 1), a mass "devoid of extremities, or parts designed to support or move these extremities." (For details concerning the relationship between the muscles of the extremities and intra-abdominal disorders see section dealing with Visceral Neurology.)

The Muscles of the Extremities

Studied with reference to morphology and to central connections, then, the list of skeletal muscles of the body wall which may show reflex spasticities from intra-abdominal disorders is as follows[24] (see Fig. 26):

Anteriorly

1. M. rectus abdominis
2. M. diaphragma (sternocostal portions)
3. * M. pyramidalis abdominis

Laterally

A. Abdominal Group
   1. M. obliquus externus abdominis

2. M. obliquus internus abdominis
3. M. cremaster
4. M. transversus abdominis

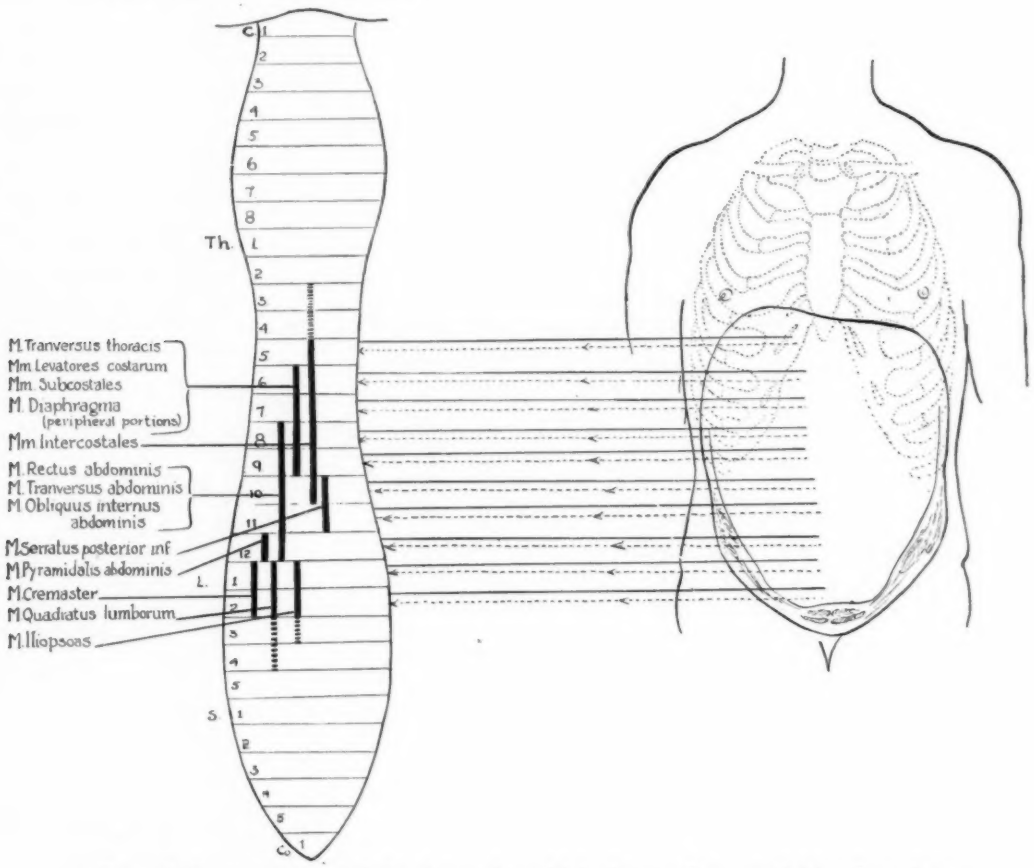

FIG. 26. Innervation of skeletal muscles which show reflex spasticities from intra-abdominal disorders.

B. Thoracic Group
1. MM. intercostales externi
2. MM. intercostales interni
3. M. transversus thoracis
4. * MM. levatores costarum
5. * MM. subcostales

Posteriorly
1. M. quadratus lumborum
2. M. diaphragma (crura)
3. * M. serratus posterior inferior
4. M. iliopsoas (psoas major, psoas minor, (iliacus)
5. * M. sacrospinalis (O. T. erector spinae), and other smaller "muscles of back."

* Signifies muscles of relatively less clinical importance.

The cremasters are included because they arise from the lower portions of the internal oblique muscles. The psoas major and minor are included because they are the only muscles passing to the thigh which attach the lower extremity to the trunk and pelvic girdle; i.e. they move not only the lower extremity but the trunk as well. The peripheral portions of the diaphragm are included because they are innervated through the lower thoracic nerves in contrast to the central portion which is innervated through the phrenic nerves (C_3, C_4, C_5).

Abdominal Rigidities; Reflex; Spasticities

Little comment need be given to reflex rigidities of the recti, transversi and external and internal obliques, for these are generally and well appreciated. But certain equally constant analogous rigidities are not so commonly recognized. It would seem unreasonable to believe that any of these muscles, possessing as they do motor nerves and central connections, should fail under certain conditions to be thrown into reflex spasticity, even though this spasticity be imperfectly understood, difficult to detect, or appear to be of relatively less clinical value. Spasticities of the intercostal muscles and diaphragm from abdominal disorders are, perhaps, not generally appreciated, but account for the dyspnea which often accompanies such upper abdominal conditions as acute cholelithiasis and cholecystitis. Reflex spasms of the quadratus lumborum, psoas, and cremaster muscles are as important in many renal and ureteral disorders as are rigidities of the anterior muscles from acute diseases of the appendix or gall bladder. No clinical tests have been described in regard to spasticities of the pyramidalis, serratus posterior inferior, the transversus thoracis; and probably, from the small size and the anatomical positions of these latter muscles, they are of relatively less clinical value, yet their central connections demand that they be included in the present list.

The accompanying chart tabulates, for convenience, many of the following points with which the abdominal surgeon should be familiar concerning each muscle: its origin, insertion, function, meaning of name, innervation by peripheral nerves,

relationship to spinal segmentation and to the involuntary nervous system; also the position or body posture caused by its continued contraction, and points of special clinical significance.

After a brief discussion as to methods for detecting reflex muscular rigidities, clinical points will be reviewed concerning the muscles which have been tabulated with reference to the diagnosis of intra-abdominal diseases.

The Examination for Rigidity

While spasm of a muscle may produce a characteristic alteration in position or a typical posture which is readily detected by inspection alone, chief reliance for the discovery of muscular rigidity must be placed upon palpation. Abdominal palpation is performed with the flexor surfaces of the fingers and hand, laid almost flat upon the belly walls. A slow, steady pressure, combined with slight flexion of the fingers, gives the examiner a means for estimating the resistance present. To poke at the abdomen with the fingertips alone produces a voluntary muscle spasm. Spasm is also induced by examining hands which are cold. The hands may be warmed by dipping them in tepid water, by holding them for a few moments within the axillae, by rubbing them briskly together; or the examination may be commenced with a layer of cloth (gown, sheet, towel) between the examiners hands and the skin of the patient. The patient lies in a relaxed position, arms at the side, head flat, thighs and legs resting upon the bed, or the thighs are slightly flexed over a bolster or pillow (attempts to have the patient keep his own thighs flexed without support may result in more rather than less abdominal tension); the patient is instructed to breathe deeply and quietly through the mouth; talking, on the part of the patient, is discouraged, but the examiner both by his tone and manner attempts to quiet the patient and to divert attention from the examination. The mind of the examiner, on the other hand, keeps pace with the examining hand and an attempt is made to visualize intra-abdominal structures. If the patient has complained of symptoms in a certain region of the abdomen, palpation

commences at a distance from this point and the area supposedly involved is secondarily approached.

To detect slight degrees of involuntary spasm requires great care and as a rule clinical experience. A valuable method suggested by Murphy is known as "bimanual comparative abdominal palpation."[25] Here, in place of examining first one region, then another, by means of a single hand, the examiner places his two hands in analogous positions upon the belly wall (example, the two lower quadrants) and by increasing pressures slowly and equally with the two hands, observes whether one hand sinks more deeply into the abdominal wall than the other (see Fig. 27). "Compare the manner in which the examiner's left hand sinks into the patient's left iliac fossa to the lessened descent of the right hand on the side

Comparative Bimanual Abdominal Palpation

FIG. 27. Method of bimanual comparative abdominal palpation. Note how fingers of left hand sink deeply into abdominal wall while those of right hand undergo a lessened descent, due to rigidity of right lower quadrant (appendicitis). Exactly equal pressure must be exerted by the two hands.

of the slightly inflamed appendix." Differences in abdominal tension which might otherwise easily be overlooked may be detected and objectively demonstrated by the use, after practice, of this method of comparative palpation.

Palpation through the Indrawn Wall

Abdominal palpation proves particularly unsatisfactory when the patient is muscular or is apprehensive regarding the examination. Voluntary rigidity prevents the examining fingers from reaching a sufficient depth satisfactorily to search for tumors and misplaced or enlarged organs. The following technical "dodge" may be employed to put the overactive abdominal muscles to direct use and to remove apprehension, changing the patient's mental attitude from one of guarded resistance to one of cooperation. Carry the examining fingers to whatever depth they will readily sink with slow steady pressure; then ask the patient to "draw the abdominal muscles inward," that is, to make his abdomen "as thin as possible;" now ask the patient to relax completely and to breathe with the mouth wide open. It will be found that as the abdominal muscles are drawn inward the examining fingers sink to a surprisingly greater depth and as the patient relaxes, the abdomen may be palpated at the new level with relative ease and satisfaction (see Fig. 28). This method of examination might be designated "palpation through the indrawn wall."[24]

Palpating with a Depressed Costal Arch

Another aid to palpation consists of making inward pressure upon the lower ribs anteriorly, thereby shortening the distance between the points of origin and insertion of the anterior abdominal muscles of that side, adding to their relaxation. The technic for the procedure is as follows:[24] Place the "heel" of the dorsiflexed hand (i.e. the thenar and hypothenar eminences) over the hypochondrium upon the side to be palpated (i.e. over the lower portion of the anterolateral surface of the thoracic cage); make steady pressure upon the ribs until they sink definitely backward; with the opposite hand palpate the subcostal area and upper quadrant of this side of the abdominal wall. It will be found that as the cage

FIG. 28. Abdominal palpation with indrawn wall.

A. Voluntary rigidity prevents the examining fingers from sinking into the abdominal wall.

B. Examining fingers sink deeply into abdominal wall as the patient draws his anterior wall sharply inward.

C. As the patient then relaxes the examining fingers remain deep within the wall, facilitating the examination.

is pressed inward, the fingers of the examining hand sink to a lower level, enhancing the ease of abdominal examination. This method might be designated "palpating the abdomen

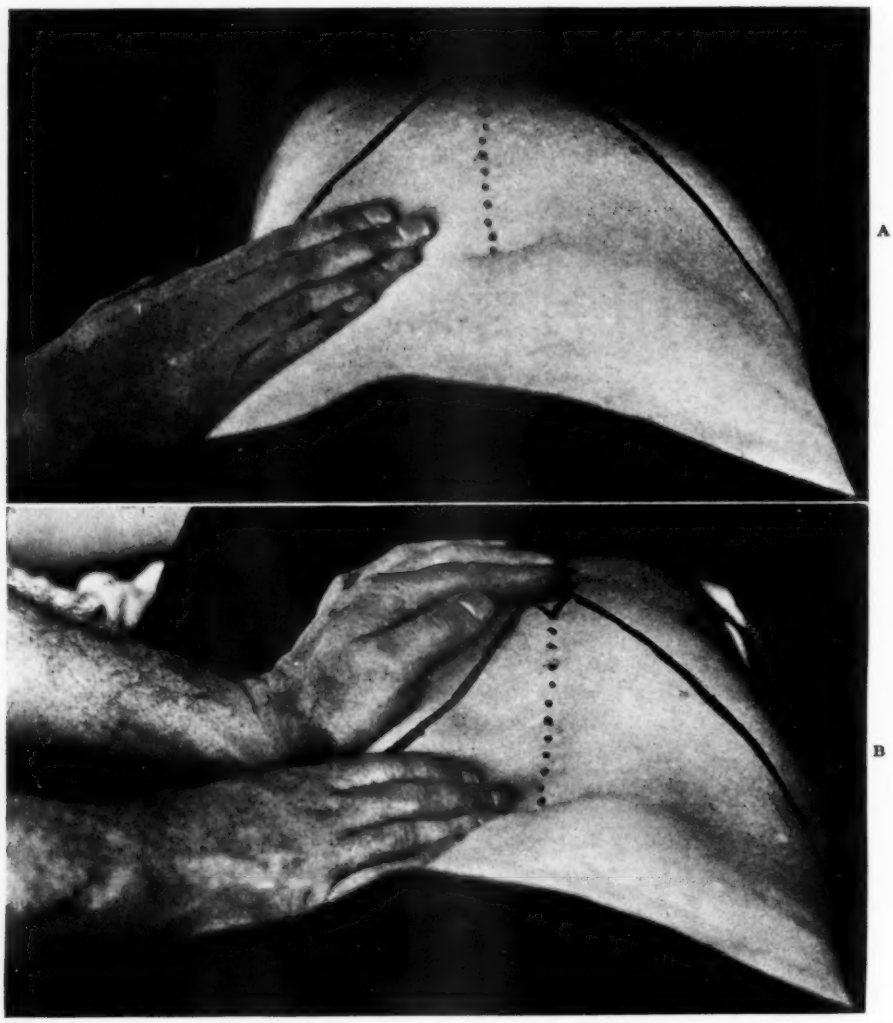

FIG. 29. Abdominal palpation with depressed costal arch.

A. Voluntary rigidity renders the examination unsatisfactory.

B. As the costal arch is pressed inward the muscles of the anterior abdominal wall are relaxed, facilitating the examination.

with a depressed costal arch" (see Fig. 29). Abdominal palpation conducted with the aid of both the indrawn wall

and the depressed costal arch increases to a maximum the total area of abdomen which comes within reach of the examining fingers.

Reflex Dyspnea from Abdominal Disorders

Respiratory difficulties may readily be demonstrated clinically as an accompaniment of acute abdominal disorders as well as of thoracic diseases. In numerous isolated accounts a reflex spasticity of the muscles of inspiration observed with pathological changes within the abdomen has been convincingly described. Postoperative respiratory changes were discussed over a quarter century ago (Czerny[26]) and suggested as one possible cause for the development of postoperative pneumonia. Diaphragmatic spasticity has been reported as occurring with perforated and perforating gastric ulcers (Hubeny,[27] 1916; Hughes[28] 1917). Reflex spasticity of the diaphragm, confirmed by auscultation and roentgen-ray examinations, was demonstrated by Sale[29] (1918) in 19 cases of acute appendicitis (Sale's phenomenon). Dyspnea from acute pancreatitis has been frequently observed (Pottenger,[30] Cope[31]). Dyspnea has been stated to be present in 71 per cent of cases of acute cholelithiasis (Bodenstab,[32] 1918, in a study of the symptoms in 500 cases of gall-bladder disease). That these convincing observations have not gained general recognition, however, is apparent in the fact that textbooks dealing with acute abdominal disorders rarely make mention of such reflex dyspnea as a symptom. Even those current reference books written for the express purpose of listing the various possible causes of individual signs and symptoms, discuss over a hundred conditions giving rise to the several types of dyspnea without giving any indication that this symptom (dyspnea) might arise as a reflex from acute diseases of abdominal organs such as the stomach, gall bladder, pancreas, or appendix. All too frequently no history is sought of "inability to take a full breath" or "catches in breathing" when interviewing patients with suspected cholelithiasis or cholecystitis.

Dyspnea with Cholelithiasis

Inspiratory Dyspnea

Reflex spasticity of the respiratory muscles arising from abdominal disorders, is produced through the lower intercostals

(muscles innervated from the 5th to the 12th thoracic levels of the cord), through the peripheral portions of the diaphragm (innervated by the lower intercostal nerves), and through the serratus posterior inferior, (10th and 11th thoracic levels, posterior rami) and other lesser muscles of respiration, levatores costarum, subcostales and the transversus thoracis which receive innervation through the anterior rami of the lower intercostal nerves. The dyspnea takes the form of difficulty with the inspiratory phase of the respiratory cycle, particularly upon attempts at forced inspiration.

Methods for Detecting Spasticity of the Diaphragm

Since the diaphragm cannot be directly palpated, diminished action of this muscle upon a single side may be detected by the following methods. (a) By auscultation. Here there is found a quantitative difference between the involved and non-involved sides as to the loudness, length, and intensity of the inspiratory murmur (feebleness upon the right side with cholecystitis). (b) By roentgen-ray examination. Sales states that "the Roentgen ray in every case substantiated the stethoscopic findings;" with acute appendicitis the right dome was found to be flatter than the left and showed a diminished excursion (normally if any difference between the two domes can be detected it is the right side which is more dome-shaped and has the wider excursion). (c) By direct observation of the diaphragmatic phenomenon, using the same methods as utilized when searching for Litten's sign (see section on eponyms); (the diaphragmatic phenomenon is retarded and the excursion lessened upon the involved side). (d) By percussion, i.e. percussing the lower thorax posteriorly first during quiet breathing, then during forced inspiration, and measuring the difference in level of the dullness present, thus obtaining the estimate of the excursion of the diaphragm upon that side (comparison of the two sides shows a diminished excursion upon the side involved.

Differentiation between Thoracic and Abdominal Disorders

This involvement of certain of the muscles of respiration by both abdominal and thoracic disorders adds to the difficulties of differential diagnosis. It should be recalled, however,

that when the afferent or sensory stimuli arise from above the diaphragm (thoracic diseases) additional muscles of respiration are usually involved (levels above the 5th thoracic) and reflex spasticities in the upper thorax and in the muscles attached to the shoulder girdle are added to the clinical picture (see trapezius test in differentiating between basilar pleurisy and acute appendicitis etc.; (Visceral Neurology). Here the dyspnea tends to be relatively more acute and to affect both phases of the respiratory cycle, while abdominal rigidity, if also present, tends to be greatest immediately below the costal arches. When the afferent or sensory stimuli arise from below the diaphragm, upon the other hand (abdominal disorders), the dyspnea is relatively less in degree, is inspiratory in character, and is not associated with spasticities or tenderness in the muscles of the upper portions of the thorax or those directly concerned with movements of the upper extremity. With abdominal diseases yielding the dyspnea, there is also present a marked rigidity of the abdominal muscles and this is greatest, not immediately below the costal arches, but over the region well known to be reflexly associated with the abdominal organ involved. In the presence of dyspnea of the spastic type, then, an estimate should always be attempted as to which is the greater: the thoracic rigidity (as evidenced by diminished expansion) or the abdominal rigidity (as detected by palpation), and the full extent of the involvement of thoracic muscles should be determined. The data gathered from physical examination, as in any differential diagnosis, must be most carefully correlated with a complete and detailed history. Clinical errors in which a needed abdominal operation is delayed under the impression that the disease present is thoracic are relatively uncommon. Blunders in which a needless abdominal operation is performed when the disease is actually present within the chest (pleurisy, pneumonia, mediastinal hemorrhage mistaken for acute appendicitis) occur with relative frequency. It must be recalled (see Section 1, the abdominal roof) that all of the nerves passing to upper abdominal viscera must traverse the

Correlation of Physical Findings with History

thoracic cage before reaching their destination, hence they are exposed to direct irritation from thoracic disorders.

Cremaster Spasm and the Subinguinal Syndrome

Spasticity of the cremaster muscles gives rise to accentua-

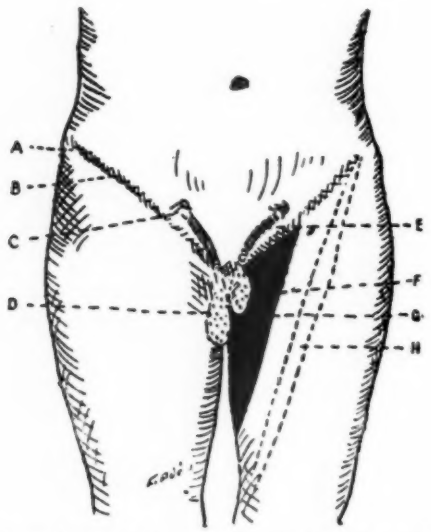

FIG. 30. Subinguinal syndrome of renal colic. Triangular cutaneous area of clinical value in determining presence of intra-ureteral tension.

A, crest of ilium. B, anterior superior spine. C, abdominal ring. D, normal position of testis E, Spermatic cord and cremaster muscle. F, Elevated testis. G, Skin zone. H. Sartorius muscle.

tion of the cremasteric reflexes, to corrugation of the scrotal skin, and to retraction of the testicle. It would be difficult to overestimate the value of cremaster spasm in the differentiation of renal colic from acute intra-abdominal conditions such as acute appendicitis and acute cholelithiasis. Given a patient with severe colic, the detection by simple inspection of cremaster spasm clearly indicates the correct diagnosis, for this sign constitutes presumptive evidence of renal or ureteral colic. Cremaster spasm is usually associated with the other phenomena of the so-called "subinguinal syndrome" of acute ureteral colic[33,34] (i.e. hyperesthesia limited to the ureteral skin triangle of the thigh, altered responses to heat and cold within this area, local vasomotor phenomena, tenderness of the isolateral testicle) (see Fig. 30). (See Visceral Neurology.)

Lateral Flexion of the Trunk with Renal Colic

Spasticity of the quadratus lumborum causes the trunk to be flexed laterally toward the involved side (inability to assume an erect posture). Rigidity of this muscle, as that of other muscles of the loin, is caused by renal or ureteral disorders and by diseases of other structures innervated through upper lumbar cord levels, rather than through diseases of upper abdominal organs which have their central connections at thoracic cord levels.

Psoas Test; Spastic Flexion of the Thigh

Spasticity of the iliopsoas similarly (lumbar innervation) is reflexly produced through lower abdominal, renal or pelvic disorders rather than by upper abdominal conditions. The psoas muscle, however, due to its position immediately beneath the parietal peritoneum, may be directly involved or irritated by inflammations or productive infiltration over the muscle. Continued contraction of the iliopsoas causes a flexion posture of the thigh. Reflex spasticity of lesser degrees may be detected by the so-called psoas test (Treves;[35] Cope[36]) which consists of searching for muscular resistance and pain as the lower extremity is passively hyperextended. In making this examination the patient may lie face downward and the thigh be then lifted upward, or the patient may lie on the side opposite to the one being tested, as the lower extremity is slowly forced backward.

Viscerogenic Reflex Spasticities vs. Peripheral Nerve Irritations

To illustrate the manner in which the psoas may be thrown into a state of spasticity by organs which are not directly connected with the muscle by way of the spinal cord and the white rami comunicantes but which involve the muscle directly: The patient with an acute appendicitis may have a rigidity of the right lower quadrant and also a flexion posture of the thigh or positive psoas test, both being due to muscle spasm, but the rigidity of the anterior and lateral abdominal muscles represents an early involvement and is a reflex spasticity produced through the involuntary nervous system, while the rigidity of the posterior muscles represents a later and a direct involvement caused by a local irritative process from the overlying inflammation and is produced by way of the cerebrospinal system.

All of the spasticities referred to will again be considered in the section dealing with Visceral Neurology and at that point attention will be focused upon the specific neurone pathways and synapses which make possible alterations in the skeletal muscles which may be detected during the clinical examination.

Hoarseness with Colics

There are many motor phenomena associated with abdominal disorders other than those which involve the muscles of the abdominal walls *per se*. There may occur (by way of the vagus) a spastic contraction of the laryngeal muscles, giving rise to hoarseness as observed with severe colics (and although Hippocrates spoke of "the muffled voice of colics,"[37] how often still is the patient unjustly maligned for speaking in a whisper); there may occur involvement of the muscles associated with the eye (by way of the cranial autonomics) with a resulting disturbance of vision; the tensor tympani muscle of the inner ear may be reflexly involved (vagus) with a resulting tinnitus aurium; through the nervus erigens there may occur analogous spasticities of smooth muscles in the rectal and perirectal regions. At times the motor responses from intra-abdominal disorders represent viscerovisceral phenomena, where both the afferent and efferent stimuli travel exclusively within the involuntary or vegetative nervous system (example: reflex pylorospasm); at other instances they are of the visceromotor type, where the afferent stimulus travels by way of the involuntary system but the efferent stimulus travels by way of the anterior root fibers of the cerebrospinal system (example, a peripheral abdominal rigidity from an acute inflammation or colic); and in still other cases the muscle spasm is simply the result of a peripheral nerve irritation, having no afferent but merely an efferent pathway (example, spastic adduction of the thigh from pressure upon the obturator nerve as it passes into the pelvis, John Hilton.[38]) In subsequent pages which deal with symptomatology, such motor responses are taken up one by one, in detail, an attempt being made both by charts and words to give as accurate as possible an explanation of the most common of the clinical signs.

Viscerovisceral vs. Visceromotor Phenomena

It is obvious that the surgeon must thoroughly study *all* of the muscles which form a part of the abdominal walls and that even this is not sufficient since there are instances in which intra-abdominal diseases may cause motor phenomena at every level of the cerebrospinal system, some in the cranial, others in the cervical, and still others in the thoracic, lumbar, or sacral levels (Visceral Neurology).

The Skeletal Support vs. the Skeletal Protection of the Abdomen

2. *The Bony Walls.* No portion of the body receives less skeletal support than the abdomen. The only bones which belong exclusively to the abdominal division of the trunk are the five lumbar vertebrae. The abdomen, as already observed, is a muscular bag. Yet while the abdominal cavity receives but little skeletal support it by no means follows that it receives inadequate skeletal protection. Protection is obtained both from the bones of the thoracic cage and from those of the pelvic walls. The abdomen, due to the domed shape of the diaphragm, has been seen to extend well within the thoracic cage which serves to protect all the organs of the supracolic division of the peritoneal cavity. Similarly, the abdomen in its lower aspects (within the protection of the iliac bones) blends with the true pelvis and the separation of abdomen and pelvis is purely arbitrary. A list of the bones which overlie, and therefore in reality form walls for the abdominal cavity are:[39] a variable portion of fifteen of the twenty-four ribs; the five lumbar vertebrae, with their numerous processes and intervertebral discs; the xiphoid process of the sternum (cartilaginous); the iliac bones; the upper border of the sacrum; and portions of the pubes.

The Limitations of Abdominal Palpation

Posteriorly and laterally, then, the abdomen is provided with almost complete bony protection. And upon the sides, the lower ribs and their cartilages extend to within one to three finger-breadths of the iliac crests! Upon the lateral wall of the abdominal cavity the purely muscular portion is simply this narrow interosseous space of but 1 to 3 inches in width. At the level of the tip of the eighth costal cartilage (intercostal angle), not over 10 per cent of the circumference

TABLE

STUDY OF SKELETAL MUSCLES WHICH SHOW REFLEX SPASTICITY FROM

Muscles	Cord Levels	Peripheral Innervation	Functions
M. rectus abdominis..... M. obliquus externus abdominis.....	Th7-12	Anterior rami of lower six thoracic nerve	Support abdominal organs Aid in act of expiration Aid in acts of vomiting, defecation, micturation, and parturition Flexors of vertebral column and pelvis
M. obliquus internus abdominis..... M. transversus abdominis	Th7-L1	Ant. rami lower six thoracic nerves. Lower portions of muscles likewise by the iliohypogastric nerve (L1)	
M. pyramidalis abdominis.	Th 12	Anterior ramus of last thoracic nerve	Aids rectus abdominis Tenses fascia of ant. wall
M. cremaster.....	L1-2	Genitofemoral nerve	Elevates testicle Corrugates scrotal skin
Diaphragma (peripheral)...	Th7-12	Anterior rami of lower six thoracic nerve	Aids in inspiration "Fixes" lower ribs
M. serratus posterior inferior	Th11-12	Posterior rami of last two thoracic nerves	Fixes twelfth rib Aids diaphram in inspiration
MM. intercostales externi MM. intercostales interni MM. levatores costarum. MM. subcostales..... M. transversus thoracis..	Th2-10 (Abdominal Reflexes-Th5-10)	Anterior rami of the thoracic nerves	Aid in acts of both inspiration and expiration
M. sacrospinalis (and other "posterior groups")	(Th2-L5) (Th5-L2)	Posterior rami of all Spinal nerves	Extensors, lateral flexors, rotators or vertebral column
M. quadratus lumborum...	L1-4 (L1-2)	Anterior rami of first three lumbar nerves	Lateral flexor of vertebral column. Assists with inspiration
M. iliopsoas	L1-4 (L1-2)	Anterior rami first three lumbar nerves	Flexes hip joint, also trunk on extremity. Medial rotation of thigh

I

ABDOMINAL DISEASES (IMPULSES TRAVELING OVER WHITE RAMI COMMUNICANTES)

Body Posture from Continued Contraction	Associated Clinical Data
Patient lies flat on back Abdomen "splinted" Distance from costal margin to pelvis shortened Costal arch depressed on involved side	Segmental and local rigidities with such acute conditions as appendicitis and cholelithiasis Local muscular tenderness (as above) Board-like abdominal wall (anterior) with acute peritonitis Thoracic breathing Excessive flaccidity and atrophy with chronic peritonitis.
Muscle small and inconstant.....	Marked tension and tenderness immediately above symphysis pubis
Testicle elevated. Scrotum small and wrinkled	Functional muscle change associated with tenderness of isolateral testicle and other changes in "subinguinal syndrome of ureteral colic Ureteral skin triangle of hyperesthesia
Unilateral diminution of inspiratory phase	Lessened excurion of thoracic cage Diminution of diaphragmatic phenomenon Fluoroscopic flattening of domes Auscultatory and percussion evidence (see text)
Diminution of respiratory movements..	Local tenderness (deep) over muscle
Fixation of chest..... Lessened alteration of both anteroposterior and lateral diameters of thoracic cage	Thoracic respirations diminished Chest movements of involved side lessened "Quiet lung" on involved side Abdominal breathing
Spine held rigid, flexed and rotated to involved side	See function. Local deep segmental tenderness
Body drawn toward involved side.....	Deep muscular tenderness between twelfth rib and iliac crest. Patient unable to stand erect
Flexion of thigh, slight internal rotation Tends to flex trunk on lower extremity Slight lateral flexion of trunk	Affected locally by peritonitis on lower posterior wall of cavity. Thigh is flexed on trunk. Trunk slightly flexed to involved side. Psoas test positive (passive extension of thigh and external rotation painful) Walking interfered with

of the abdomen is free of bone. The limitations of abdominal palpation must be apparent.

Bony Landmarks of the Abdominal Wall

The bones which are so widely distributed over the ab-

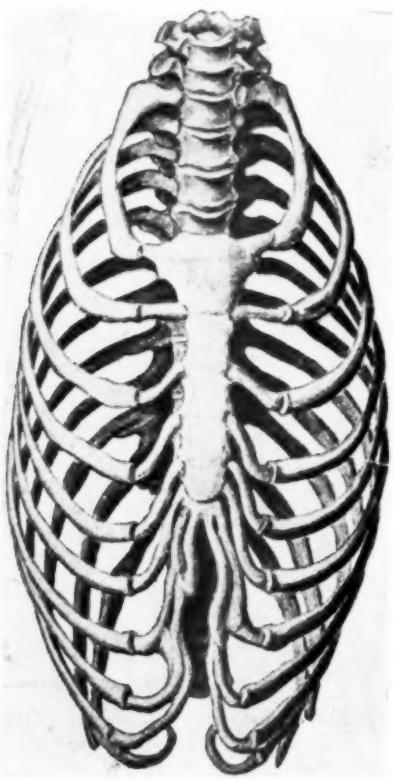

FIG. 31. Skeleton of thoracic cage showing marked deformity characteristic of "habitus enteropticus." Note unusually narrow intercostal angle. (After Schultze.)

domen provide a convenient system of landmarks. Such points are of use in outlining the various viscera, in localizing tumors, in determining the exact sites for the injection of local anesthetics. The landmarks of the spinal column and os coxae are fixed and constant. Those connected with the costal margins are inconstant in position since the thoracic cage is attached only posteriorly and is movable. In the portion of this chapter headed Abdominal Topography, details concerning the clinical use of these bony points are discussed.

The Intercostal Angle

It has been said that every abdominal examination should begin with an inspection of the intercostal angle.[40] Differences of the most profound nature exist between patients having narrow and those having wide intercostal angles.[41] These differences concern the intra-abdominal arrangement of the organs, intra-abdominal pressure and pressure variations; also matters pertaining to surgical diagnosis and treatment (see Fig. 31). Under the headings Visceroptosis, and Mesenteric Ileus will be found full discussions regarding the causes and results of variations in the angle formed by the costal margins. A study is made of the relationship between non-rotation of the bowel or partial rotations of the bowel and the secondary bony changes within the thoracic cage; the visceroptotic individual is considered as the victim of a congenital constitutional defect and as one who possesses a fundamental weakness of connective tissue. So important an index as to the type of the individual is the configuration of the intercostal angle that the observation of this bony landmark should, perhaps, be the first step in any abdominal examination.*

[* The study of the abdominal walls will continue in the March issue of the Journal.]

EPONYM

JAMES MARION SIMS

Eponym: Sims' position.
The left lateral decubitus.

Name, Nativity: James Marion Sims. Lancaster District, South Carolina, U. S. A.

Birth, Death: Born, January 25, 1813. Died November 13, 1883.

Connections: A founder of the State Hospital for Women in 1855 (New York City).
Made Governor and Senior Consulting Surgeon of Woman's Hospital (New York) in 1868.
Surgeon-in-Chief of Anglo-American Ambulance Corps in 1870 (Franco-Prussian War).
Member of Board of Surgeons, Woman's Hospital, 1872.
President of American Medical Association in 1876.
President of American Gynaecological Society in 1880.

Education: Received degree of Bachelor of Arts at the College of South Carolina in 1832.
Began the study of medicine in the office of Dr. B. C. Jones, a practitioner of Lancaster, S. C.
Took his first series of lectures in medicine at the Medical College of Charleston, South Carolina (1834).
A graduate from Jefferson Medical College, Philadelphia, in 1835.

Source of Eponym: From book of author: Clinical Notes on Uterine Surgery, published in London in 1866 by Robert Hardwicke (pp. 23–24).

Other Writings: His first contribution to surgical literature was his paper on Trismus Nascentum appearing in the *American Journal of Medical Sciences* in 1846.
Silver Sutures in Surgery (1849).
Vesicovaginal fistula (1852).
The Careful Aseptic Invasion of the Peritoneal Cavity for the Arrest of Hemorrhage, the Suture of Intestinal Wounds, and the Cleansing of the Peritoneal Cavity, and for all Intraperitoneal Conditions (1881).
(See indices for other Papers.)

Discussion of Eponym: Sims, while practicing in Alabama, was called to attend a country woman who had sustained an acute displacement of the uterus due to a fall from a horse. While examining his patient digitally by the vaginal route with the patient upon her knees, he was suddenly unable to feel the displaced uterus and the patient was at that moment relieved of her symptoms. Sims was unable to account for this until, as his patient assumed the dorsal decubitus, there was a sudden expulsion of air which gave a ready explanation of the replacement of the uterus. Thereafter Sims employed the knee-chest position as a routine for vaginal examinations and described in his writings how air, with its 14 pounds pressure to the square inch, aided in dilating the vaginal walls; he then devised his special speculum (first a bent spoon) to aid in the admitting of air for the visual examination. Later, after coming to New York, he changed to the routine use of the left lateral posture for pelvic examinations, using the knee-chest posture only for special examinations or treatments.

Points of Interest: Sims, "a kind-hearted but impulsive man, was one of the most original and gifted of American surgeons."
His career as a specialist in New York City was preceded by eighteen years of general practice in Alabama.
Sims moved to New York as the result of two years of sickness in which he wandered about but was unable to practice (persistent diarrhea which had proved generally fatal to patients remaining in Southern states).
With a growing family and in straightened circumstances he settled in the outskirts of New York City (1853) at what is now Madison Avenue at 29th Street. There was at that time no first-class dwelling nearer than 23d Street, and the location afforded a full view of the East River. Sims' first patient, who suffered from vesicovaginal fistula, was referred by Dr. Valentine Mott.

CLINICAL NOTES

ON

UTERINE SURGERY.

WITH SPECIAL REFERENCE TO THE

MANAGEMENT OF THE STERILE CONDITION.

BY J. MARION SIMS, A.B., M.D.

LATE SURGEON TO THE WOMAN'S HOSPITAL, NEW YORK,

Fellow of the New York Academy of Medicine; of the New York Pathological Society; of the New York Historical Society; of the New York State Medical Society; of the Royal Medical and Chirurgical Society, London; of the London Medical Society; of the Pathological Society; Hon. Fellow of the Obstetrical Society, London; Honorary Member of the Gerunin Society of Physicians and Naturalists, Paris; Hon. Fellow of the Imperial Academy of Medicine of Belgium; Knight of the Légion d'Honneur, &c.

NEW YORK:
WILLIAM WOOD & CO., 27 GREAT JONES ST.
1873.

PREFACE.

In 1862, I voluntarily left my own country, on account of its political troubles. Our unfortunate civil war continued much longer than any of us, North or South, anticipated. In consequence of this my residence abroad was prolonged far beyond my original intention. I therefore had time to look over my note-books, and to cull such facts as illustrate the method of treating Uterine Disease at the Woman's Hospital. These facts are strung together in the form of these "Notes."

For a speculum examination the patient is to lie on the left side. The thighs are to be flexed at about right angles with the pelvis, the right being drawn up a little more than the left. The left arm is thrown behind across the back, and the chest rotated forwards, bringing the sternum very nearly in contact with the table, while the spine is fully extended, with the head resting on the left parietal bone. The head must not be flexed on the sternum nor the right shoulder elevated. Indeed, the position must simulate that on the knees as much as

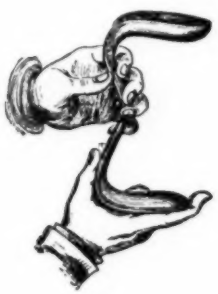

FIG. 8.

possible, and for this reason the patient is rolled over on the front, making it a left lateral semiprone position. The nurse or assistant standing at her back pulls up the right side of the nates with the left hand, when the surgeon introduces the speculum, elevates the perineum, and gives the instrument into the right hand of the assistant, who holds it firmly in the desired position.

FIG. 32. Title page and preface page from Sims' book in which he describes the "Sims' position."

Continued from p. 82

During the Civil War, for political reasons Sims moved to Europe where he resided in London and Paris for six years.

Due to the fact that outsiders were stopped from visiting his clinics and that his plea to admit cancer patients to the hospital was denied, Sims resigned from the Woman's Hospital in 1874. He had no further connections with this institution until shortly before his death when he again became a member of the consulting board.

In 1894 European and American admirers erected a statue to the memory of James Marion Sims, in Bryant Park, New York City.

Special References:

A Memoir of James M. Sims (Emmet) Appleton, 1884. A Story of My Life (Sims). N. Y., 1884.

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Am. J. Obstet., N. Y. 17: 52–61, 1884.

New Orleans M. & S. J., 23: 455–460, 1895–6.

EPONYM

GEORGE RYERSON FOWLER

Eponym: Fowler's position.

The semi-sitting posture for the treatment of acute peritonitis.

Name: Nativity: George Ryerson Fowler, New York City.

Birth, Death: Born, December 25, 1848. Died, February 6, 1906.

Connections: His first appointment came in 1883 as Surgeon to St. Mary's Hospital at Jamaica, L. I.

Four years later he was one of the two attending surgeons at the Seney Methodist Episcopal Hospital in Brooklyn.

Later, Surgeon-in-Chief to the Brooklyn Hospital.

Other hospital appointments: Consulting surgeon to the Relief Hospital of the Eastern District; to Norwegian Hospital.

For five and one-half years Professor of Surgery in the New York Polyclinic Medical School; later Professor Emeritus of that institution.

Examiner in surgery to the Board of Regents of the University of the State of New York.

Chief Surgeon of Division, United States Volunteers, being commissioned by Pres. McKinley with rank of Major.

First President of the Brooklyn Red Cross Society (1890).

Delegate to the International Medical Congress in Moscow (1897) and Paris (1900).

Education: Graduated (M.D. degree) from Bellevue Hospital Medical College in 1871.

Took no interneship but went directly into general practice.

Source of Eponym: Fowler contributed his article titled, "Diffuse Septic Peritonitis, with Special Reference to a New Method of Treatment, namely the Elevated Head and Trunk Posture to Facilitate Drainage into the Pelvis; with a Report of Nine Consecutive Cases of Recovery" to the *Medical Record* of New York for April 14, 1900.

Other Writings: Wrote a treatise on appendicitis in 1894. This was revised and enlarged in 1900.

Associate Editor of the *Annals of the Anatomical and Surgical Society*, later the *Annals of Surgery*.

At the time of his death Fowler has completed two volumes on General Surgery.

Did important work in thoracic surgery, his name being particularly associated with the subject of decortication of the lung in the treatment of chronic empyema.

Discussion of Eponym: It is of interest to note that the position for which Fowler is known was first suggested by his son and assistant, Dr. Russell Fowler, as a possible aid in preventing postoperative vomiting. The senior Fowler, noting the favorable effect of the position upon a patient with acute peritonitis, made an extensive study of the reasons for the observed improvement. Dr. George Fowler, in his writings, gives full credit to his son for suggesting the elevation of the head.

The Fowler's position is at present not infrequently spoken of as the full sitting posture, while the position in which the patient's head is elevated by 12 to 18 inches is termed the modified Fowler position. From the photostat here reprinted it is seen that the original "Fowler position" is semi-sitting posture. The semi-sitting posture for use in surgery had been vigorously advocated over a hundred years before by White[1] whose original article shows special tables for maintaining the patients in the desired position; but it was undoubtedly the work of Fowler which popularized the postural treatment for peritonitis.

Points of Interest: In regard to his text on surgery it has been said: "The book is the epitome of his life; into every page of it he infused his own personality. In its clearness of diction, comprehensiveness of treatment and the practical directions for resort to surgical relief, it is unsurpassed by any book of its day."

Fowler, with the aid of his son, corrected the proof for this text but never lived to see his own book.

Fowler seemed of tireless disposition and often after full days of operating wrote, in his own library, far into the night.

SUPPLEMENT: A. J. S., n. s. Vol. VIII, No. 2, p. 500

Medical Record

A Weekly Journal of Medicine and Surgery

Vol. 57, No. 15. Whole No. 1536. NEW YORK, APRIL 14, 1900. $5.00 Per Annum. Single Copies, 10c.

Original Articles.

DIFFUSE SEPTIC PERITONITIS, WITH SPECIAL REFERENCE TO A NEW METHOD OF TREATMENT, NAMELY, THE ELEVATED HEAD AND TRUNK POSTURE, TO FACILITATE DRAINAGE INTO THE PELVIS. WITH A REPORT OF NINE CONSECUTIVE CASES OF RECOVERY.[1]

BY GEORGE R. FOWLER, M.D.,

NEW YORK,

PROFESSOR OF SURGERY IN THE NEW YORK POLYCLINIC; SURGEON TO THE METHODIST EPISCOPAL HOSPITAL, ETC.

THE peritoneum is virtually an enormous lymph sac, and therefore peritonitis is lymphangitis. The absorbents of the structure of the peritoneum are represented by the lymphatics, and the protection which these afford against infecting agents by exudative material thrown out (thrombo-lymphangitis) to act as a defensive barrier by blocking the lymph channels serves to preserve the life of the subject, on the one hand, and to limit the area of infection on the other.

It was during the after-treatment of a case of diffuse septic peritonitis the result of early perforation of a violently inflamed appendix directly into the peritoneal cavity and between the coils of small intestine, and in which I had placed a glass drain as well as a number of wick drains deep in the pelvis, that the line of thought above expressed occupied my mind. My assistant, Dr. R. S. Fowler, had been in the habit of treating cases of vomiting following etherization by raising the head of the bed as high as possible consistent with comfort, thus bringing the force of gravity to bear in facilitating normal peristalsis. In view of the favorable course which the case then in hand was pursuing, it was determined to adopt this as a routine procedure for the purpose of facilitating the passage of septic fluids from the general peritoneal cavity to that of the pelvis, where, according to the reasoning above outlined, it would do but little harm, comparatively speaking, and from which locality it could be more readily removed by drainage methods. This has been done, and a further experience with the method seems to bear out the favorable opinion first entertained of this measure as of value in aiding to combat the mortality in this much-dreaded condition.

The angle assumed has varied somewhat, but I insist that the elevation of the bed from the horizontal shall be at least from twelve to fifteen inches. In order to prevent the patient from sliding down in the bed a large pillow is placed folded beneath the flexed knees, and upon this the buttocks rest. The pillow is prevented from sliding by a piece of stout bandage passed through at the folded portion and secured to the sides of the bedstead.

The following is a list of the cases consecutively treated by this method to date:

CASE I.—October 17, 1899; Brooklyn Hospital. Diffuse septic peritonitis from a combined appendicular and adnexal lesion, originating, in all probability,

FIG. 33. Page from the *Medical Record* for April 14, 1900, containing Fowler's article in which he describes the "Fowler position."

Continued from p. 84

On February 2, 1906, while on a train bound for Albany, N. Y. to conduct examinations in surgery, Fowler was suddenly seized with acute abdominal pain. He was taken to a hospital in Albany where he directed that the surgeons do as they saw fit concerning his illness. He was operated upon for acute appendicitis but died on the fourth day from paralytic ileus.

Special References:

[1] White, E. C. A treatise on the Management of Pregnant and Lying-in Women, and the Means of Curing, but More Especially Preventing, the Principal Disorders to Which They are Liable, etc. London, 1773.

See also Cutter I. S. Landmarks in surgical progress. *Internat. Abst. Surg.*, 47: 495, 1928.

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AM. J. SURG., n. s. 6: 685, 1929.

EPONYM

JOHN BENJAMIN MURPHY

Eponym: Murphy's method of bimanual comparative abdominal palpation.

Name: Nativity: John Benjamin Murphy. Appleton, Wisconsin, U. S. A.

Birth, Death: Born, December 21, 1857. Died, August 11, 1916.

Connections: First appointments were to the surgical staff of the Cook County Hospital and the Alexian Brothers Hospital of Chicago.

Professor of Surgery, Northwestern University (1905–1916).

Taught surgery also in the University of Illinois, and Rush Medical College.

Regent and one of founders of The American College of Surgeons.

Originator and editor of the volume on Surgery in American Year Book series; also of *Surgical Clinics*.

Honorary member of several foreign surgical and scientific societies.

Education: Graduated at age of twenty-two from Rush Medical College.

For eighteen months an interne in the Cook County Hospital.

Practiced medicine and surgery with Dr. Edward W. Lee for two years.

Subsequently spent twenty months studying in Germany.

Granted the Lartare medal by the University of Notre Dame in 1902.

Granted LL.D. degree by the University of Illinois, 1905.

Granted D.SC. degree by the University of Sheffield, England in 1908.

Source of Eponym: Chapter on The Surgery of the Veriform Appendix in Keen's Surgery, Phila., Saunders, 1913, vol. 6.

Other Writings: Murphy wrote voluminously, his writings appearing in current journals and surgical textbooks. (See index library of Surgeon Generals Office.)

Murphy was one of the first to recognize the importance of early diagnosis and early operation for acute appendicitis. He did pioneer work on the surgery of the gall bladder, alimentary tract, blood vessels, chest, bones and joints.

It has been said "there is not one branch of general surgery which has not profited by his genius."

Discussion of Eponym: Five special tests of value in differential diagnosis were proposed by Murphy; first percussion (kidney); hammer stroke percussion (gall bladder); deep grip palpation (gall bladder); piano stroke percussion (free peritoneal fluid); and comparative bimanual examination (moderate degrees of rigidity).

Murphy's name is associated with still other diagnostic and therapeutic measures. See also the Murphy button; the Murphy drip.

Points of Interest: "The personality of John B. Murphy was so brilliant, so striking, so forceful and intense, and still so attractive, that all who came in contact with him instantly recognized the presence of a remarkable man." (Ochsner.)

"Among those who knew him well he was admired and deeply respected rather than loved. Except to a very few he was not genial nor responsive in friendship . . . Murphy was beyond question the greatest clinical teacher of his day, anyone who listened to him can never forget the experience." (Moynihan.)

Murphy conducted a clinic for students and practitioners which became world renowned and his great ability brought to him a stream of rare and difficult cases.

Murphy was faithfully aided in his researches by his wife (Jeanette C. Plamondon). Mrs. Murphy anesthetized all of the animals used in the extensive experiments on bowel anastomosis and at all times acted as assistant and companion.

Special References: The American College of Surgeons dedicated to John B. Murphy the first unit of their permanent home in Chicago (1924).

Surg. Gynec. & Obst., 23: 234, 1916.

Ibid., Vol. 31: 549, 1920.

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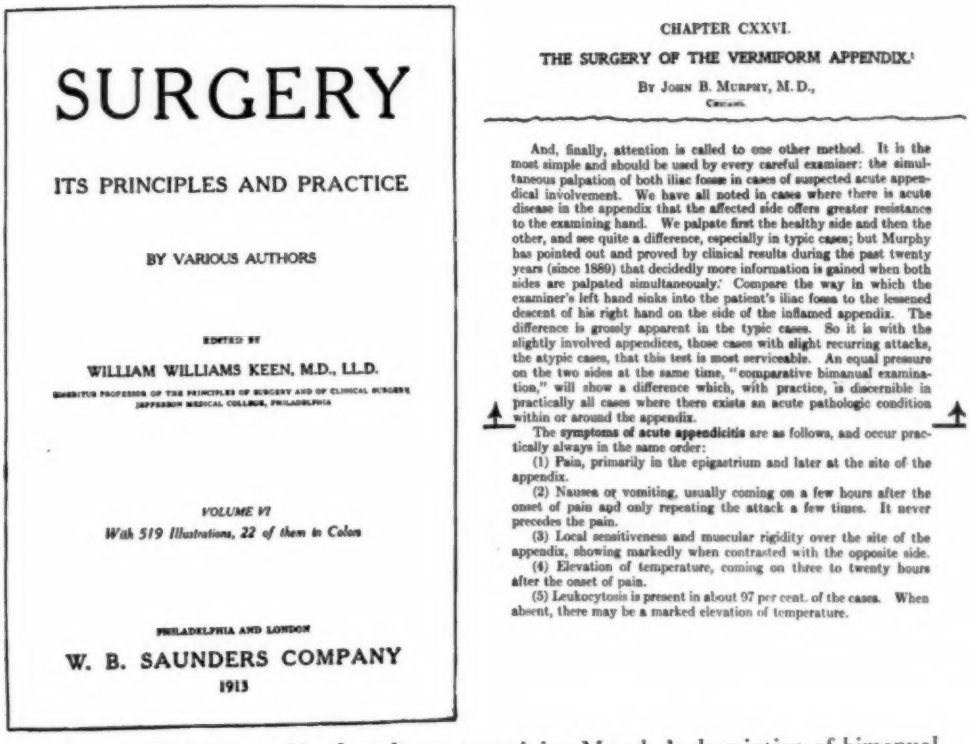
Cleveland M. J., 15: 532, 1916.

SUPPLEMENT: A. J. S., n. s. Vol. VIII, No. 2, p. 502



SURGERY

ITS PRINCIPLES AND PRACTICE

BY VARIOUS AUTHORS

EDITED BY

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VOLUME VI

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1913

CHAPTER CXXVI.

THE SURGERY OF THE VERMIFORM APPENDIX.[1]

By John B. Murphy, M.D.,

Chicago.

And, finally, attention is called to one other method. It is the most simple and should be used by every careful examiner: the simultaneous palpation of both iliac fossæ in cases of suspected acute appendical involvement. We have all noted in cases where there is acute disease in the appendix that the affected side offers greater resistance to the examining hand. We palpate first the healthy side and then the other, and see quite a difference, especially in typic cases; but Murphy has pointed out and proved by clinical results during the past twenty years (since 1889) that decidedly more information is gained when both sides are palpated simultaneously.[1] Compare the way in which the examiner's left hand sinks into the patient's iliac fossa to the lessened descent of his right hand on the side of the inflamed appendix. The difference is grossly apparent in the typic cases. So it is with the slightly involved appendices, those cases with slight recurring attacks, the atypic cases, that this test is most serviceable. An equal pressure on the two sides at the same time, "comparative bimanual examination," will show a difference which, with practice, is discernible in practically all cases where there exists an acute pathologic condition within or around the appendix.

The **symptoms of acute appendicitis** are as follows, and occur practically always in the same order:

(1) Pain, primarily in the epigastrium and later at the site of the appendix.

(2) Nausea or vomiting, usually coming on a few hours after the onset of pain and only repeating the attack a few times. It never precedes the pain.

(3) Local sensitiveness and muscular rigidity over the site of the appendix, showing markedly when contrasted with the opposite side.

(4) Elevation of temperature, coming on three to twenty hours after the onset of pain.

(5) Leukocytosis is present in about 97 per cent. of the cases. When absent, there may be a marked elevation of temperature.

FIG. 34. Title page of book and page containing Murphy's description of bimanual comparative abdominal palpation.

QUESTIONNAIRE

1. What constitutes the floor or lower boundary of the abdomen?
2. Bound the pelvic inlet.
3. What is the pelvic diaphragm? Its action?
4. Why is the pelvic floor of interest to the abdominal surgeon?
5. Describe the relation of the rectum to the peritoneum.
6. What peritoneal abnormalities may be discovered by rectal examination?
7. What is meant by "a transcelomic malignant transplant"?
8. Give a technic for the rectal digital examinations.
9. What various positions may be employed in making a rectal examination?
10. Describe the Sims' position. The lithotomy position.
11. Describe the method for passing a sigmoidoscope.
12. What are the normal curvatures of the rectum?
13. What structures normally felt upon rectal digital examination may easily be mistaken for tumors?
14. What are the advantages of rectoabdominal palpation?
15. Explain why foreign bodies passing through the anus may reach higher levels within the enteral canal.
16. Name the evidences obtained through alvine discharges of biliary disease, pancreatic disease, ulceration within the bowel wall.
17. What is a pelvic peritoneal hernia?
18. How may small bowel be injured in the treatment of procidentia recti?
19. What is meant by rectopexy? By archocele?
20. Is the peritoneal cavity an open or a closed space?
21. What is the pathogenesis of pneumococcus peritonitis?
22. What is the most striking contrast between the walls of the upper and lower divisions of the trunk?
23. Give the derivation of the following words: chest, thorax, abdomen, belly, venter.
24. What is the ventriculus?
25. Name the muscles of the abdominal wall.
26. Give a list of the skeletal muscles of the body wall which may show reflex muscular rigidities due to intra-abdominal disorders.
27. With what muscles must an operator deal in entering the abdominal cavity at various points?
28 Name the muscles covering the abdominal cavity on its (a) anterior and lateral walls, (b) its posterior walls, (c) its floor, (d) its roof.
29. Trace some of the nerve pathways through which abdominal organs are connected with skeletal muscles.
30. What cord levels are connected with the prevertebral ganglionic chains of the thoracicolumbar division of the involuntary nervous system by means of the white rami communicantes?
31. Through what cord levels are afferent stimuli arising from the ureter in renal colic chiefly relayed to skeletal structures?
32. From what cord levels do the muscles of the upper extremities receive their motor neurones? The lower extremities?
33. What muscles connect the lower extremity with the pelvic girdle and trunk?
34. What skeletal muscles are in reflex association with afferent stimuli arising from the central portion of the diaphragm?
35. What skeletal muscles are in reflex association with peripheral portions of the diaphragm?

SUPPLEMENT: A. J. S., n. s. Vol. VIII, No. 2, p. 504

36. Give the innervation of the muscles reflexly associated with abdominal organs. What is the posture assumed from the continued contraction of each of these muscles?
37. Describe the technic of an examination for abdominal rigidity.
38. What is meant by "comparative bimanual abdominal palpation"; its advantages?
39. What is meant by "palpation of the indrawn abdominal wall"?
40. What is meant by "palpation with the depressed costal arch"?
41. What is the diaphragmatic phenomenon?
42. What is Litten's sign?
43. What is the cause of dyspnea as observed with acute biliary colic?
44. What abdominal organs may give rise to reflex spasticity of muscles of respiration?
45. Give four methods by which spastic contraction of one side of the diaphragm may be detected.
46. Since reflex spasticity of muscles of respiration may be caused by both intra-abdominal and extra-abdominal disorders, how can the determining factor be ascertained?
47. What is meant by the "subinguinal syndrome of renal colic"?
48. What are the effects of spasm of the cremaster muscle?
49. What is the significance of cremaster spasm in a differentiation of acute appendicitis from renal colic?
50. What is the ureteral cutaneous triangle of the thigh"?
51. State the postural effect of spasticity of the quadratus lumborum muscle.
52. What is the relation between spasm of the iliopsoas muscle and acute appendicitis?
53. What is the psoas test?
54. Explain the muffled voice often noted during acute attacks of colic.
55. How can intra-abdominal muscles reflexly effect the eye or ear?
53. What are viscerovisceral phenomena? Visceromotor phenomena?
57. Differentiate a visceromotor reflex from a peripheral nerve irritation. Give nerve pathways for example of each.
58. How is the abdomen supported by the skeleton?
59. What bones belong exclusively to the abdominal division of the trunk?
60. Distinguish between the skeletal supports and the skeletal protections of the abdomen.
61. What bones serve directly to protect abdominal organs?
62. How many ribs, or parts of ribs, overlie the abdomen?
63. What percentage of the abdominal cavity is covered by bone?
64. How closely do the lower ribs approach the iliac crests?
65. What abdominal viscera are normally palpable?
66. What is meant by "mesenteric ileus"?
67. What is the intercostal angle?
68. Of what importance is the intercostal angle to the surgeon?
69. Why is the intercostal angle found in visceroptotic individuals?
70. What is the relation between incomplete rotation of the intestine and congenital visceroptosis?

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